LIFEPAK 10

defibrillator / monitor / pacemaker

PHYSIO CONTROL

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This device is to be used by authorized medical personnel only.

Federal (USA) law restricts this device to sale by or on the order of a physician.

ABOUT DEFIBRILLATION

The LIFEPAK 10 defibrillator/monitor is a therapeutic medical device intended for use by or under the direction or guidance of a physician. Direct current defibrillation is a recognized means of terminating certain potentially fatal cardiac dysrhythmias.

A direct current defibrillator applies a brief, high-energy pulse of electricity to the heart. This energy may be delivered either through external paddles or electrodes on the chest.

Defibrillation is only one aspect of the medical care required to resuscitate a patient in ventricular fibrillation. Depending on the situation, other supportive measures may include:

- Establishment and maintenance of a patent airway
- Ventilation, including administration of oxygen
- Maintenance of blood circulation
- Pharmacologic measures

Among other factors, it is recognized that the likelihood of successful resuscitation of a patient is related to the length of time between the onset of ventricular fibrillation and defibrillation. Rapid defibrillation and prompt follow-up care are essential. The physiological state of the patient may affect the likelihood of successful defibrillation or skeletal muscle contractility. Thus, failure to convert the dysrhythmia or to resuscitate a patient is not a reliable indicator of defibrillator performance. Similarly, the patient's muscular response to the defibrillator shock is not a reliable indicator of the energy delivered. Refer to "Defibrillation: What You Should Know" booklet for further information.

Daily testing is important to determine the state of readiness of the equipment. In addition, the device must be kept in proper operating condition at all times through routine maintenance and repair by a qualified service technician. Refer to the Service Manual for further service information.

GENERAL WARNINGS

In addition to the following warnings, other warnings are provided near the beginning of each section. For reference, all the warnings provided throughout this manual are reproduced in Appendix A.

- **Possible loss of power during patient care.** Proper care and maintenance of batteries is vital to the performance of the LIFEPAK 10 defibrillator/monitor. Always carry a spare, *fully charged, properly maintained* battery.
- **Shock hazard.** When discharged, this defibrillator delivers up to 360 joules of electrical energy. Unless discharged properly as described in these Operating Instructions, this electrical energy may cause personal injury or death. Do not attempt to operate this device unless you are thoroughly familiar with these Operating Instructions and the function of all controls and indicators, as well as the connections and accessories.
- **Shock or fire hazard.** Do not immerse any portion of this device in water or other fluids. Avoid spilling any fluids on device or accessories. Do not clean with alcohol, ketones, or other flammable agents. Do not autoclave this device or accessories.
- **Possible fire or explosion.** Use care when operating this device close to oxygen sources (such as bag-valve-mask devices or ventilator tubing) and flammable gases and anesthetics.
- **Safety risk.** Use of non-Physio-Control defibrillation and pacing electrodes, batteries, battery chargers, accessories, or adapter devices may cause the device to operate improperly.
- **Possible interference with implanted devices.** Magnets inside the standard defibrillation paddles may affect the function of an implanted pacemaker or implanted defibrillator if paddles are positioned over or near implanted devices. Have function of implanted device checked after using standard paddles.
- **Safety risk and possible equipment damage.** Defibrillators, monitors, pacemakers, and their accessories (including electrodes and cables) contain ferromagnetic materials. As with all ferromagnetic equipment, these products must not be used in the presence of the high magnetic field created by a Magnetic Resonance Imaging (MRI) device. The high magnetic field created by an MRI device will attract the equipment with a force sufficient to cause death or serious personal injury to persons between the equipment and the MRI device. This magnetic attraction may also damage the equipment. Consult with the MRI manufacturer for more information.

GENERAL CAUTIONS

- To help prevent component damage, the device should not be mounted near vibration sources such as engine struts and landing gear.
- The device may be damaged by mechanical/physical abuse (e.g. immersion in water, drop exceeding 30 inches with carrying case, drop exceeding 18 inches without carrying case).

TERMS

Terms used in this manual and on the LIFEPAK 10 defibrillator/monitor:

Danger: Immediate hazards which will result in serious personal injury or death.

Warning: Hazards or unsafe practices which could result in serious personal injury or death.

Caution: Hazards or unsafe practices which could result in minor personal injury or product/property damage.

SYMBOLS

The symbols below may be found on various configurations of the LIFEPAK 10 defibrillator/monitor and accessories.

Off (power: disconnection from the AC mains)

On (power: connection to the AC mains)

Defibrillation protected, type BF patient connection

Defibrillation protected, type CF patient connection

Labels: Attention, consult accompanying documents
Status display: Contact qualified service technician

Caution, high voltage

Protective earth (ground)

Fusible link

Equipotentiality connector

\+ Positive input terminal

− Negative input terminal

12V DC Output cable

12V DC Input cable

Recycle battery symbol

Paddles Icon

Battery

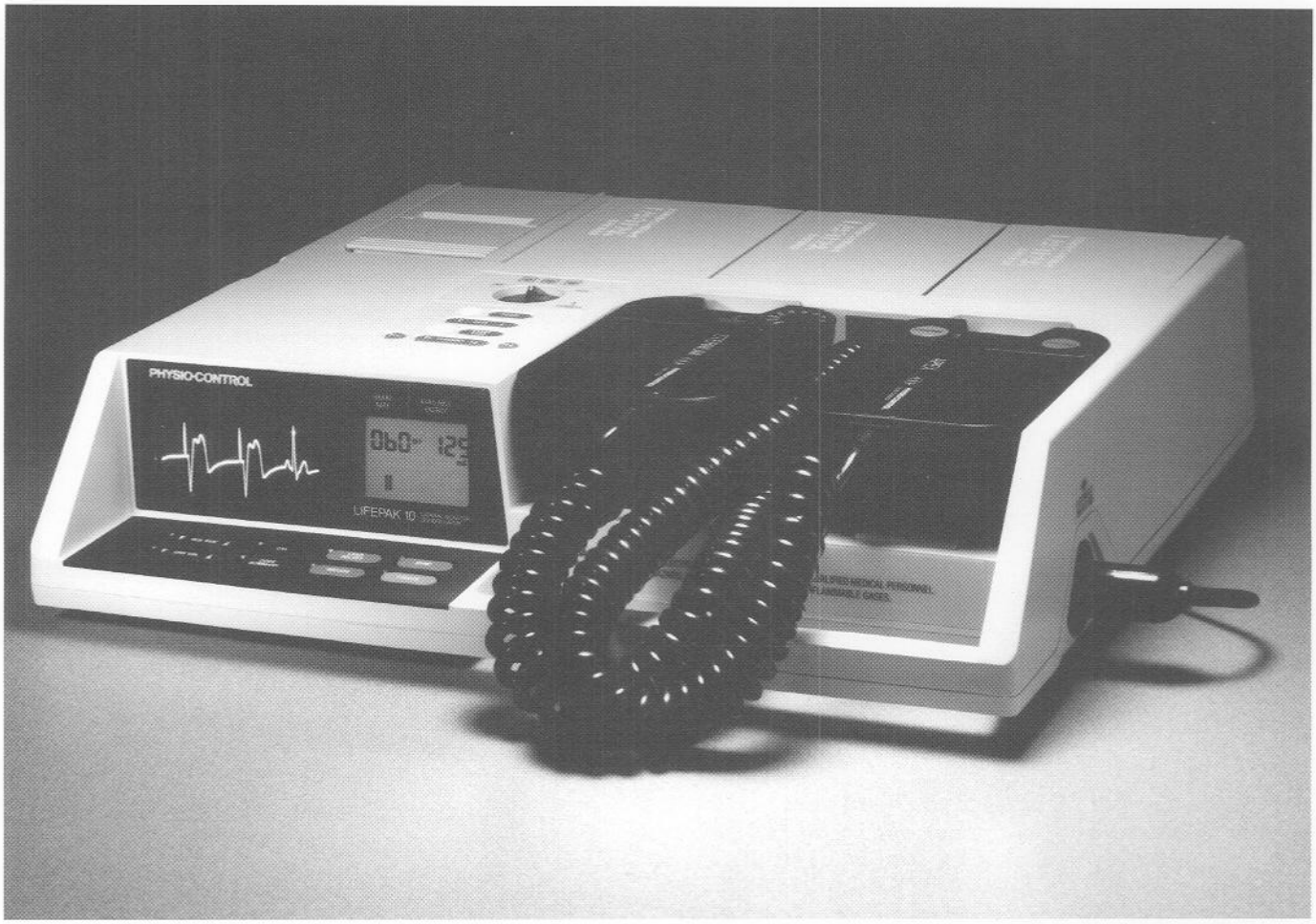
Plug

Dangerous voltage

Output

AC current

Output AC/Digital



The LIFEPAK 10 defibrillator/monitor is a complete cardiac life support system used by paramedics in the field, by hospital staff for transport or crash cart needs and by other authorized healthcare providers.

This device is intended for use in the diagnosis and treatment of cardiac dysrhythmias. Refer to American Heart Association (AHA) or equivalent guidelines regarding standards of care for defibrillation, synchronized cardioversion and noninvasive pacing.

With this device Physio-Control offers the following:

- Integrated noninvasive pacemaker option
- CODE SUMMARY™ critical event record
- Brighter cardioscope
- Programmable options
- FAST-PATCH adapter option
- Optional AC and DC auxiliary power modules
- Battery Support System
- Optional 12 Lead ECG Adapter
- Service diagnostics
- Post-sale support
- Educational support

Integrated Noninvasive Pacemaker Option

Physio-Control has been providing noninvasive pacing therapy since 1960 when the Cardiometer, the first commercially marketed external pacemaker, was introduced.

Physio-Control pacing technology has been validated by extensive clinical testing and documented in numerous published studies.

The pacemaker option has a current output range of 0-200mA. Its superior QRS detection system maximizes the effectiveness of demand pacing. Pacing output is restricted to 0mA when the pacemaker is first turned on or whenever a pacing lead detaches, helping protect clinicians and patients from unexpected output of pacing pulses.

CODE SUMMARY Critical Event Record

Automatically stores, documents, and summarizes critical events including defibrillation, cardioversion, pacing, and operator-selected ECG segments for concise, time saving post-code analysis.

Brighter Cardioscope

Large, brilliant, non-fade cardioscope for viewing ECG in low light, normal conditions, or bright sunlight.

Programmable Options

Offers flexibility through programmable feature selection. Factory, Service or biomedical personnel may select options for diagnostic recording, lead available at power up, language, maximum pacing rate, auxiliary output, ECG filter, and others.

FAST-PATCH Adapter Option

Uses flexible, self-adhering disposable defibrillation/ECG electrodes for hands-free defibrillation which are compatible with the LIFEPAK 5, 6, 7, 8, 9 family, 10, 200, 250 and 300 defibrillator/monitors. Offers fast and convenient monitoring, defibrillation and cardioversion therapy.

Optional AC and DC Auxiliary Power Modules

Allows use of line power or 12 volt DC power when battery power is not needed. Auxiliary power module trickle-charges batteries installed in the defibrillator/monitor.

Battery Support System

The Battery Support System provides battery maintenance, defibrillator testing, and recharges a fully depleted FASTPAK® battery in approximately 70 minutes. Any one of three installed batteries can power the LIFEPAK 10 defibrillator/monitor, enabling depleted batteries to be replaced without loss of power.

Optional 12 Lead ECG Adapter

This small, lightweight adapter acquires serial, diagnostic quality 12 lead ECG recordings using a 10 lead ECG cable.

Service Diagnostics

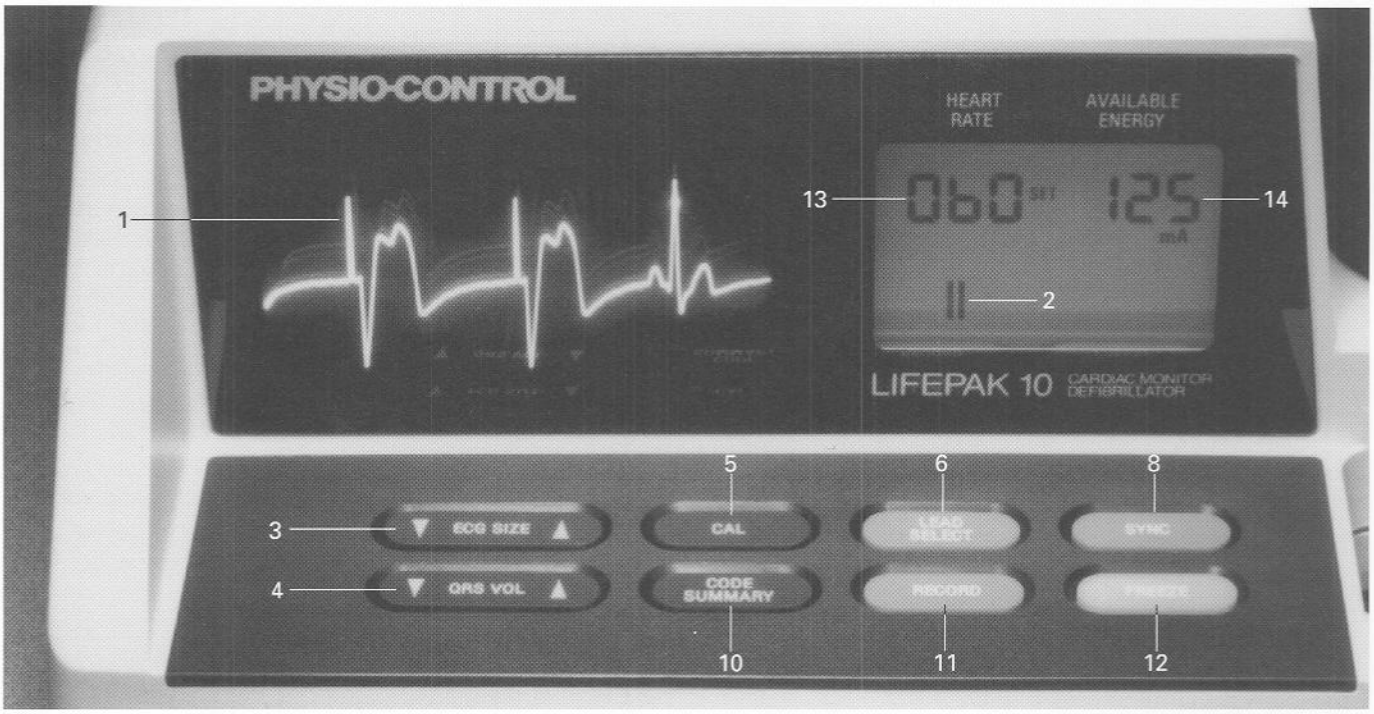
Device self-diagnostics automatically alert the operator at power up and during operation when certain service needs are identified. Defibrillation usage history is also automatically stored, and calibration is possible via an external service port.

Post-Sale Support

Physio-Control has one of the largest sales and technical service teams in the industry. The LIFEPAK 10 defibrillator/monitor has a one year warranty for parts and labor. Physio-Control responds to service calls as quickly as possible with 24 hour a day service in the USA. Arrangements are made to perform repairs or a loaner is provided. Local sales and service representatives are available worldwide to offer inservicing and technical support.

Educational Support

With each LIFEPAK 10 defibrillator/monitor our customers receive an inservice videotape, and a copy of our educational booklet "Defibrillation: What You Should Know." "Noninvasive Pacing: What You Should Know," is also provided to customers who purchase the integrated noninvasive pacemaker option. A 35mm pacing slide program is available for purchase or loan. For further information, contact your Physio-Control sales consultant. Telephone support by clinical (USA only) and technical staff is available Monday through Friday for our customers.

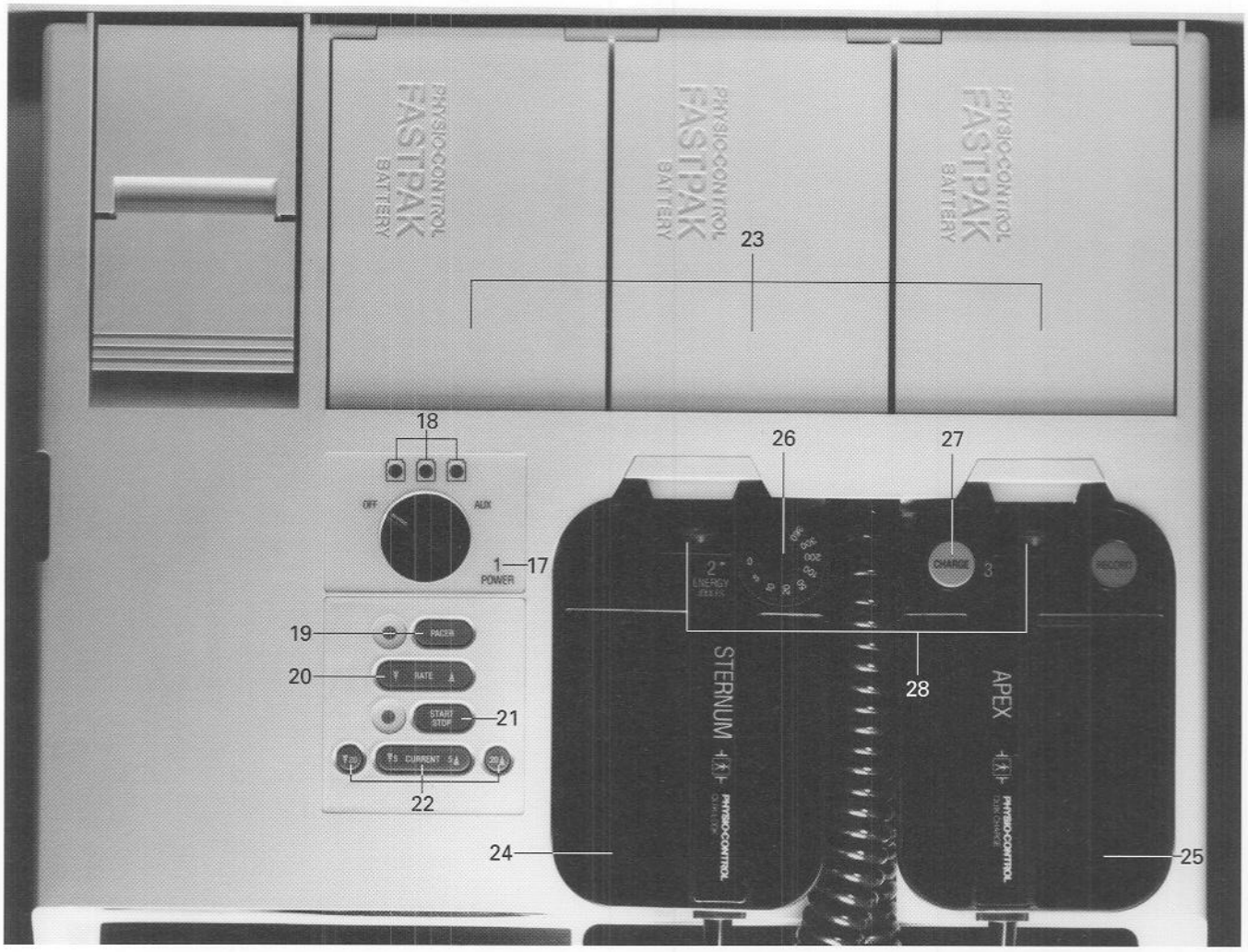


FRONT PANEL

1.	CARDIOSCOPE	Non-fade display; ECG trace moves from right to left.
2.	STATUS DISPLAY	Alphanumeric information on status display indicates heart rate, AVAILABLE ENERGY, lead selected, SYNC mode, DIAG mode, pacing current and rate, pacing electrode connection message (LEADS), and service indicator.
3.	ECG SIZE	Button adjusts vertical size of ECG trace on cardioscope and recorder from 0.2cm/mV to 4.0cm/mV. Push ▲ to increase or ▼ to decrease ECG size. Three tones indicate minimum or maximum ECG size has been reached.
4.	QRS VOLUME	Button adjusts the volume of systole beeper. Push ▲ to increase or ▼ to decrease volume.
5.	CAL	Button superimposes 1mV calibration signal on cardioscope and recorder (not active in SYNC mode).
6.	LEAD SELECT	Button selects ECG input: PADDLES (⏍), Leads I, II, III. Push momentarily to advance one position. The device may be programmed to power up in either PADDLES or leads.

7. LEAD SELECT INDICATOR (not shown)	Alphanumerics on status display identify lead selection.
8. SYNC	Button selects synchronized mode. To return to asynchronous mode, push SYNC again. Defibrillation (asynchronous) mode is automatically selected when defibrillator is powered on. Device automatically returns to asynchronous mode after each discharge. If synchronized cardioversion needs to be reattempted, push SYNC again.
9. SYNC MODE INDICATOR	SYNC message appears on status display. Message blinks off with each detected QRS.
10. CODE SUMMARY	Button provides summarized documentation of critical events (i.e., pre- and post- defibrillation/ cardioversion events, pacing parameters, and selected monitored ECG segments).
11. RECORD	Activates thermal array recorder. Prints time, date, ECG lead, ECG size, heart rate, SYNC if activated, and pacing parameters. Button starts and stops recorder. RECORD on APEX paddle performs identically. If the diagnostic frequency response mode has been enabled during set-up, holding RECORD down for more than one second selects diagnostic recording mode (DIAG) and begins recording. Diagnostic mode must be reselected with each new recording. Recorder runs continuously when in DIAG mode.
12. FREEZE	Freezes trace on cardioscope. Recorder continues to display a delayed trace.
13. HEART RATE	Displays two functions: • With PACER off, displays measured heart rate from ECG cable, defibrillation electrodes, or standard paddles; range: 20-295 beats per minute (bpm). • With PACER on, displays selected (not measured) pacing rate from pacemaker control panel; range: 40-170 bpm.

14. AVAILABLE ENERGY	Displays two functions: • With PACER off, displays an independent confirmation of the value selected from the ENERGY select dial (0-360J). A single tone sounds when charging is complete. • With PACER on, displays selected pacing current (0-200mA) from pacemaker control panel.
15. SERVICE INDICATOR	If the ⚠ symbol continuously displays, have the LIFEPAK 10 defibrillator/monitor promptly examined by a qualified service technician.
16. LEADS	Displays when: • Pacing is attempted without connecting the pacing cable/pacing electrodes. • Pacing cable/pacing electrodes become detached from patient during pacing current delivery. • Pacing is attempted in PADDLES lead.

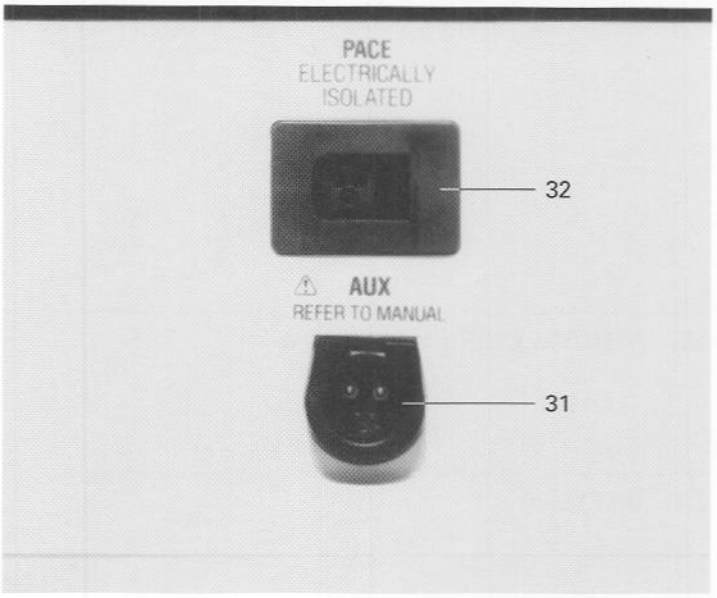


TOP PANEL

17. **1** POWER	Rotary switch turns device on and off. Select battery (▢) or, if available, auxiliary power source (AUX).
18. LOW BATTERY	When indicator is: Flashing – battery in use is nearly depleted; immediately switch to a charged battery. Continuously on – indicates battery is depleted; replace depleted battery. Device may shut down with no LOW BATTERY indicator if battery is damaged, improperly maintained, or depleted. (e.g. if battery is very low on charge and operator attempts to charge defibrillator.)

19. PACER	Button turns pacemaker power on. Light adjacent to PACER illuminates when pacemaker is on. Pacemaker power can be turned off by: pressing PACER again, charging defibrillator or selecting PADDLES lead.
20. RATE	Button selects pacing rate: 40-170 bpm selectable in 10 bpm increments. Push ▲ to increase rate; push ▼ to decrease rate.
21. START/STOP	Button starts delivery of pacing energy via pacing electrodes. Whenever START is engaged, the light adjacent to START/STOP flashes off with each pacing pulse delivered and a pacing spike displays on the ECG trace. Halt delivery of pacing energy by: • Pushing START/STOP again • Pushing PACER again • Selecting PADDLES lead • Charging defibrillator
22. ▼ 20 ▼ 5 CURRENT 5 ▲ 20 ▲	Buttons increase or decrease pacing current. Adjustable from 0 to 200mA in 5mA or 20mA increments. Push ▲ to increase current or ▼ to decrease current.
23. BATTERY	Replaceable, rechargeable power source. Physio-Control FASTPAK, LIFEPAK 5 FASTPAK or Battery Pak batteries will power LIFEPAK 10 defibrillator/monitors.
24. STERNUM PADDLE	QUIK-LOOK® defibrillation paddle with discharge button and ENERGY select dial. Also serves as negative ECG electrode during standard paddle monitoring.
25. APEX PADDLE	QUIK-LOOK, QUIK-CHARGE® defibrillation paddle with CHARGE, RECORD, and discharge button. Also serves as positive ECG electrode during standard paddle monitoring.
26. **2** ENERGY JOULES	Rotary ENERGY select dial with 9 discrete energy levels: 0, 5, 10, 20, 50, 100, 200, 300, 360 joules.
27. **3** CHARGE	Button initiates defibrillator charge cycle. Adjacent CHARGE indicator flashes when device is charging and glows steadily when selected charge is reached. A single tone sounds when charging is complete.

28. DISCHARGE ⚠	Buttons which discharge the defibrillator. Both buttons must be pushed simultaneously to deliver energy. Energy will not be delivered unless device is fully charged to the selected energy level (AVAILABLE ENERGY agrees with ENERGY select dial, CHARGE indicator glows steadily, and a single tone sounds, indicating charging is complete).
29. BATTERY PINS (not shown)	Located in each battery well. Male connectors for FAST-PAK and Battery Pak batteries.



SIDE PANELS

30. ELECTRICALLY ISOLATED ECG CONNECTOR	Connection for 6-pin, 3 lead ECG cable (AHA and IEC versions available).
31. AUX CONNECTOR	Auxiliary connector allows the LIFEPAK 10 defibrillator/monitor to operate with the auxiliary power module. Also provides output (modulated or unmodulated) for ECG transmission (1V/mV ECG deflection).
32. PACE ELECTRICALLY ISOLATED CONNECTOR	Pacing cable connection to QUIK-PACE noninvasive pacing electrodes.
33. BAIL INCLINE (not shown)	A bail incline is located on the bottom of the LIFEPAK 10 defibrillator/monitor if angled viewing is desired.

Patient ECG can be monitored with the standard paddles using the QUIK-LOOK defibrillation paddle feature, the 3 lead ECG cable or through disposable defibrillation electrodes. For information regarding disposable defibrillation electrodes refer to FAST-PATCH Adapter/Electrodes, page 18.

WARNINGS

Important: For additional applicable safety information, refer to Appendix A, page 53.

- **Safety risk**. Use only Physio-Control ECG cables listed in this manual. Substitution of non-Physio-Control ECG cables may result in inaccurate ECG data.
- **Possible misinterpretation of cardioscope ECG data**. The cardioscope frequency response is only intended for rhythm identification. Use the recorder in DIAG mode for diagnostic interpretations.
- **Possible misinterpretation of ECG recordings**. When attempting to visually detect subtle ECG characteristics such as ST segment abnormalities, use only the recorder in diagnostic frequency response mode (DIAG). The monitor frequency response mode does not provide the resolution required for diagnostic and ST segment interpretation, and is intended only for basic ECG rhythm identification.
- **Possible electrical interference with ECG monitoring**. Do not operate this device in conjunction with electrocautery or diathermy equipment. Such equipment, as well as equipment which emits strong radio frequency signals, can cause electrical interference and distort the ECG signal displayed by the monitor, thereby preventing accurate rhythm analysis.

STANDARD PADDLES MONITORING PROCEDURE

To monitor through QUIK-LOOK paddles:

1. Apply conductive gel over the entire paddle electrode surface.
2. Turn the defibrillator/monitor **1** POWER switch to a power source. The device performs a 5 second self-diagnostic test; all indicator lights and all status display messages illuminate momentarily.

   The LIFEPAK 10 defibrillator/monitor will preselect Lead II whenever it is turned on. For information on how to change this power up selection to PADDLES, contact a qualified service technician.
3. Push LEAD SELECT to PADDLES position.
4. Place paddles firmly on patient's bare torso. The standard paddle electrode placement is STERNUM to the patient's right upper torso below the clavicle and the APEX lateral to the patient's left nipple in the midaxillary line.
5. Observe cardioscope to evaluate patient's rhythm.

When the device is turned on, the ECG gain will be at x1. ECG SIZE may need to be adjusted if QRS complex is not clearly visible on cardioscope.

ECG monitoring after defibrillation is usually delayed by a defibrillation recovery time of a few seconds. During this time, it may not be possible to determine defibrillation results from the monitor trace.

ECG ELECTRODES/CABLE MONITORING

The LIFEPAK 10 defibrillator/monitor comes with a shielded 3 lead ECG cable. The cable allows patient monitoring of Leads I, II, or III.

ECG Electrode Requirements

Electrode quality will be critical to obtaining a clean ECG signal. Always check the date code on electrode containers for expiration date before patient use. Do not use electrodes with expired date codes.

For best ECG monitoring results, silver/silver chloride (Ag/AgCl) electrodes such as Physio-Control LIFE•PATCH® ECG electrodes should be used with this equipment. Post-defibrillation visualization of ECG on the cardioscope using silver/silver chloride electrodes will be much faster than with other electrode types.

Avoid using stainless steel electrodes since post-defibrillation recovery of ECG data on the cardioscope may be delayed for 10 seconds or longer. If stainless steel electrodes must be used, careful patient evaluation combined with an extended period of cardioscope observation should precede further therapy.

Skin Preparation

Monitoring results will be best when the skin electrode sites are properly prepared as follows:

1. Shave excessive hair at electrode site. Avoid locating electrodes over tendons and major muscle masses.
2. For oily skin, clean skin with alcohol pad and let dry completely.
3. Prepare site with brisk dry rub. Avoid damage or abrasion of skin surface.

4. Carefully tear open foil package and remove electrode carrier.
5. Attach lead wire to electrode.
6. Grasp electrode tab and peel electrode from carrier.
7. Apply to patient only if gel is in solid state.
8. Hold electrode taut with both hands. Apply the electrode flat to skin. Smooth tape outwardly in all directions. Do not depress center of electrode.

ECG Cables/Leads and Color Coding

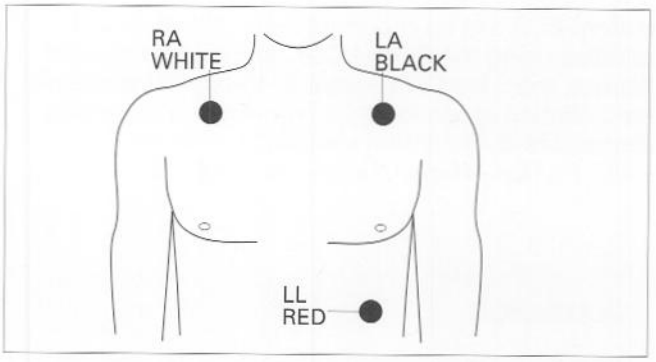
The lead wires are color coded according to AHA or IEC standards.

- AHA color coding:
  White- right arm or RA (or upper right torso)
  Black- left arm or LA (or upper left torso)
  Red- left leg or LL (or lower left torso)
- IEC color coding:
  Red- right arm or R (or upper right torso)
  Yellow- left arm or L (or upper left torso)
  Green- left leg or F (or lower left torso)

When electrodes and lead wires are attached as above, Leads I, II, or III are obtained by pushing LEAD SELECT.

When other lead configurations are desired, use the following information as a guide:

LEAD SELECT POSITION		BIPOLAR LEAD AND REFERENCE	AHA	IEC
I	RA LA LL	negative electrode positive electrode reference	white black red	red yellow green
II	RA LL LA	negative electrode positive electrode reference	white red black	red green yellow
III	LA LL RA	negative electrode positive electrode reference	black red white	yellow green red



ECG Lead placement for Leads I, II, and III. AHA color coding.

ECG CABLE MONITORING PROCEDURE

1. Attach 6-pin ECG cable to ELECTRICALLY ISOLATED ECG CONNECTOR located on the right side panel.
2. Prepare patient's skin for electrode application and apply electrodes. Refer to Skin Preparation, page 9.
3. Turn defibrillator/monitor **1** POWER switch to a power source.
4. Select desired lead with LEAD SELECT.
5. Adjust ECG SIZE if necessary. Size is automatically set to gain of x1 at power up. To properly count heart rate during routine monitoring and to accurately detect QRS complexes during pacing and synchronized cardioversion, the ECG SIZE may need to be adjusted as follows:
   - Push QRS VOL ▼ or ▲ until audible.
   - Push ECG SIZE ▼ or ▲ until systole beeper coincides with every QRS complex.
   - Adjust QRS VOL ▼ or ▲ as desired.
6. Secure and support the ECG cable.

QRS DETECTION

QRS detection is essential for use of the digital heart rate display, systole tone (QRS VOL), synchronized cardioversion, and noninvasive demand pacing.

The QRS detector in the LIFEPAK 10 defibrillator/monitor selectively detects QRS complexes. It discriminates against most noise, muscle artifact, T-waves, and other spurious signals.

Detection of QRS complexes and rejection of other signals depends on setting the ECG SIZE control properly.

If ECG SIZE is set too low, QRS complexes will not be detected; no systole tones or sense (synchronizer) markers appear and heart rate display is incorrect. If ECG SIZE is set too high, systole tones and sense (synchronizer) markers may occur on spurious signals and the heart rate display may be incorrect.

The LIFEPAK 10 defibrillator/monitor displays a heart rate between 20 and 295 bpm. Patient rates outside this range do not yield valid systole tones or heart rate display.

MONITORING PATIENTS WITH INVASIVE PACEMAKERS

The LIFEPAK 10 defibrillator/monitor detects most pacemaker impulses from internally implanted pacemakers. It does not use the pacemaker impulse for heart rate calculation, synchronization, or demand pacing inhibition. Large amplitude pacemaker spikes can overload the QRS complex detector circuitry so no paced QRS complexes are counted, resulting in blanking (heart rate displays "– –") of the heart rate display. The following may be helpful to minimize ECG pick up of large pacemaker impulses when monitoring patients with internal pacemakers:

- Place ECG electrodes so a straight line drawn between the positive electrode and negative electrode intersects a line between the pacemaker generator and the heart at right angles. Electrode placement is not as critical when the pacemaker is bipolar.
- If internal pacemaker pulse artifact continues to disrupt the heart rate display or SYNC function when monitoring with defibrillation electrodes and the FAST-PATCH adapter, monitoring with the ECG cable may improve internal pacemaker rejection.

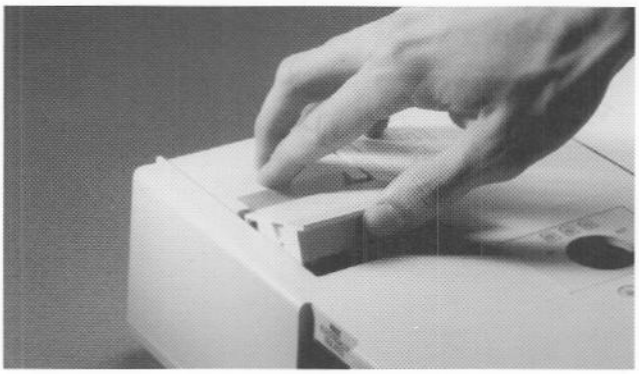
Smaller amplitude internal pacemaker pulses may not be visualized on the monitor display and/or the recording strip in Leads or PADDLES monitoring modes. To improve the visualization of internal pacemaker pulses on the recorder, try using the diagnostic mode. To improve visualization of internal pacemaker pulses on the cardioscope and the recorded ECG strips, the leads monitoring mode can be programmed during set-up mode to monitoring frequency response (agency). Refer to the LIFEPAK 10 defibrillator/monitor Service Manual or contact a qualified service technician to program Leads I, II, and III to monitor frequency response (agency) and/or enable the diagnostic frequency response for the recorder.

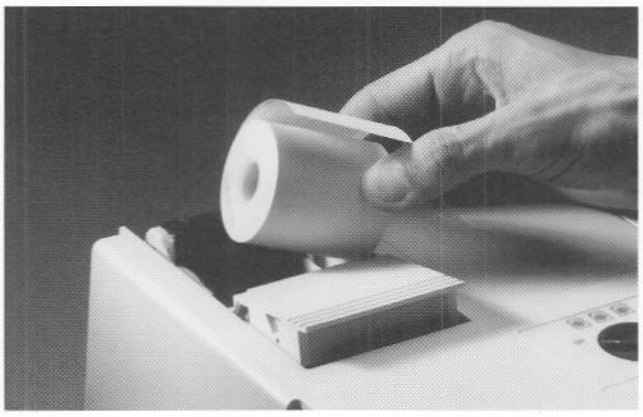
The recorder is equipped with an out-of-paper sensor to protect recorder print head. The sensor automatically turns off recorder if it runs out of paper or if recorder door is opened.

PAPER LOADING

1. Lift slotted edge of recorder to open for paper insertion.
2. Remove empty paper roll.
3. Insert new paper roll, grid facing forward.
4. Pull out a short length of paper.
5. Close paper carrier. Pull rear recorder door toward you. Push down on front recorder door.

   Caution: Use only paper designed for thermal array recorders. Use of other types of paper may damage the print head.





CARE OF RECORDINGS

To help prevent the ECG annotation and tracing from fading or disappearing, follow these guidelines for thermal sensitive paper:

- Do not apply tape or other adhesives over printed information (adhesives may be applied to back of the paper).
- Store only in paper folders; do not store or file with plastics; avoid storing in temperatures exceeding 26.7°C (80°F) and relative humidity exceeding 70%.
- Avoid extended exposure to sunlight.

RECORDER ANNOTATION

The annotating recorder prints time, date, ECG lead, ECG size, heart rate, defibrillation/synchronization, pacing parameters, and CODE SUMMARY record.

The beginning of each annotation is marked by the symbol (▶). Updated annotation information prints every 20 seconds when recorder is on. Changes made in lead selection or pacing parameters, switching into/out-of SYNC mode, or releasing the FREEZE result in an annotation update.

If FREEZE is pushed while recording, recording continues until FREEZE is released. At that time, frozen information is recorded and annotated by ////ECG-FREEZE////. The recording then returns to delayed mode.

Discharging defibrillator while recorder is on updates time, date, AVAILABLE ENERGY, and SYNC (if energy is transferred in SYNC mode) annotation.

RECORDING PROCEDURE

Recording can be done in any lead selected.

1. Push RECORD.
2. Adjust ECG SIZE if necessary.
3. Push RECORD to stop printout.

Diagnostic Recording

If the diagnostic frequency response mode (DIAG) has been enabled during set-up, holding RECORD down for more than one second selects DIAG and begins recording. ECG signal will now record at a frequency response of .05 -100Hz (per AHA recommendations).

DIAG must be reselected with each new recording. Recorder runs continuously when in DIAG mode.

The CODE SUMMARY critical event record feature documents critical events during resuscitation. It records defibrillation and cardioversion details, operator selected ECG segments, and pacing parameters in chronological order. Resuscitation details are prioritized for retention of the most critical events.

CODE SUMMARY record does not store ECG data in DIAG mode. The CODE SUMMARY record stores ECG data at the monitoring frequency response (agency or domestic) selected at set-up.

DESCRIPTION OF CODE SUMMARY RECORD

Critical events are retained in memory whenever the LIFEPAK 10 defibrillator/monitor is on. If power is removed, CODE SUMMARY report may still be obtained by applying power within 5 minutes and pushing CODE SUMMARY. After the 5 minute limit, CODE SUMMARY information will be erased.

Standard use of the recorder is available at any time by pushing RECORD once to interrupt CODE SUMMARY, then pushing RECORD again to initiate recording. This does not delete information already stored in the CODE SUMMARY record.

If there is no paper in recorder and operator presses RECORD, CODE SUMMARY feature will not store additional ECG information. Defibrillation, synchronized cardioversion, and pacing information will be stored.

CODE SUMMARY feature will only store defibrillation and/or strip chart recording events if they are separated by at least a 7 second time interval (i.e. if two defibrillation shocks are delivered within a 7 second time frame, only the first shock will be stored in CODE SUMMARY record).

CODE SUMMARY report does not print whenever defibrillator is charging to prevent historical CODE SUMMARY data from being interpreted as real time data.

Event Storage Priority

The critical event memory stores information for approximately 22 ECG events including defibrillation, pacing, recorder, and 50 event preambles (annotation to the left of the ECG segment). Events are stored in chronological order.

If CODE SUMMARY memory is full, information is retained in the following priority:

1. First and last defibrillation event preambles (with ECG segments)
2. Defibrillation and pacing event preambles (without ECG segments)
3. Recorded ECG event preambles (without ECG segments)
4. Defibrillation and pacing event preambles (with ECG segments)
5. Recorded ECG event preambles (with ECG segments)

To allow for preambles that have priority over ECG segments, ECG segments are erased in reverse chronological order.

CODE SUMMARY PROCEDURE

1. Push CODE SUMMARY to print a full report of information stored in memory.
2. To interrupt CODE SUMMARY push CODE SUMMARY again.

   The CODE SUMMARY report will also be interrupted if RECORD or CHARGE controls are activated, if power is turned off or if recorder paper is depleted.

   If CODE SUMMARY is restarted after being interrupted report will be resumed at previous event unless it was interrupted by paper depletion. If paper runs out the recording will print last three events prior to interruption.

For examples of the CODE SUMMARY strip formats refer to Appendix C, page 57.

Defibrillation success depends upon many factors; only device operational factors are addressed here. Refer to "Defibrillation: What You Should Know" for additional information. (See Other Literature and Videos, page 52 for order information.)

This section covers defibrillation using standard paddles. Refer to FAST-PATCH Adapter/Electrodes, page 18, regarding the use of FAST-PATCH defibrillation electrodes.

WARNINGS

Important: For additional applicable safety information, refer to Appendix A, page 53.

- **Shock hazard.** When discharged, this defibrillator delivers up to 360 joules of electrical energy. Do not touch the metal paddle plates or defibrillation electrodes.
- **Shock hazard.** If a person is touching the patient, bed, or any conductive material in contact with the patient during defibrillation, the delivered energy may be partially discharged through that person. Make sure everyone stands away from the patient, bed, and other conductive material before discharging the defibrillator.
- **Possible burns and ineffective energy delivery.** Do not allow physical contact between the ECG or pacing electrodes and the paddles, defibrillation electrodes, or defibrillation gel. Such contact can cause electrical arcing and patient skin burns during defibrillation and may divert defibrillating energy away from the heart muscle.
- **Shock hazard.** Conductive gel (wet or dry) on the paddle handles can allow the electrical energy to discharge through the operator during defibrillation. Be sure to completely clean the paddle plates, handles, and storage wells after defibrillation.
- **Possible skin burns.** During defibrillation, air pockets between the skin and paddle plates or defibrillation electrodes can cause patient skin burns. To help prevent air pockets, completely cover paddle plates with conductive gel and press paddles firmly against the patient, or make sure self-adhesive defibrillation electrodes completely adhere to the skin. The conductive gel or electrodes must not be dried out.
- **Possible interference with implanted pacemakers.** When cardioversion or defibrillation is performed in patients with permanent pacemakers, care should be taken to avoid placing the paddles/defibrillation electrodes near the pacemaker's generator since defibrillation can cause pacemaker malfunction. Check pacing thresholds for implanted pacemaker patients.
- **Possible interference with implanted devices.** Check function of implanted devices after defibrillation or synchronized cardioversion.
- **Possible burns and ineffective energy delivery.** A gel pathway on the skin between the paddles will cause the current to arc between paddles and divert defibrillating energy away from the heart muscle. Do not allow conductive gel to become continuous between paddle sites.
- **Possible paddle damage and skin burns.** Do not discharge the defibrillator with the paddle plates shorted together because this may pit or damage the paddle plate surface. Pitted or damaged paddle plates can cause patient skin burns during defibrillation.
- **Shock hazard.** Do not discharge the defibrillator into the open air or into paddle wells. To internally dump an unneeded electrical charge, rotate the ENERGY select dial on the STERNUM paddle or turn the defibrillator POWER switch to OFF.

Caution: Disconnect any equipment from patient which may be damaged by defibrillator shock. This may include external transvenous pacing devices.

PADDLE USAGE/OPTIONS

When employing standard defibrillation paddles, a conductive interface designed for defibrillation such as defibrillation gel, paste, or gel pads must be used between the paddle electrode surface and the skin.

Standard adult, pediatric and posterior paddles are available. The paddles selected should be determined by the patient size and the situation.

The standard adult paddles with which your LIFEPAK 10 defibrillator/monitor is shipped are for use on adults. They may also be used for any pediatric patients weighing greater than approximately 10kg (22 lbs) as long as the paddles fit completely on the chest and there is a least 1 inch of space between the paddle electrodes. Pediatric paddles should be used for patients less than 10kg or those whose chests cannot accommodate the standard paddles and space required.

PADDLE PLACEMENT

Anterior-Lateral

The standard paddle electrode placement is STERNUM to the patient's right upper torso below the clavicle and the APEX lateral to the patient's left nipple in the midaxillary line.

Anterior-Posterior

There are two possible anterior-posterior paddle placements.

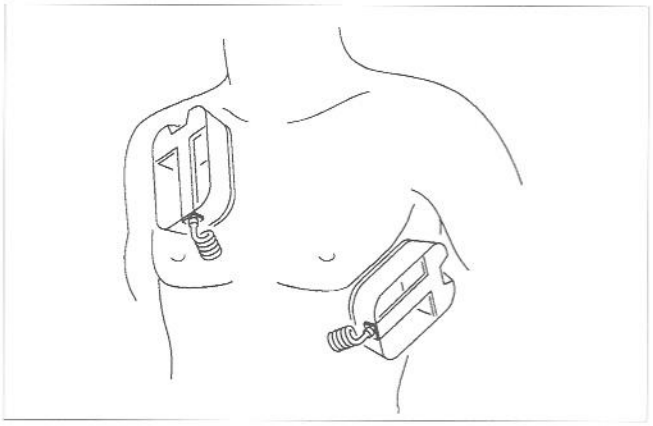
The preferred position is to place STERNUM anteriorly over the left precordium and the APEX posteriorly behind the heart in the infrascapular area.

An alternative is to place STERNUM over the cardiac apex and the APEX on the patient's right posterior infrascapular area.

Special Placement Situations

Implanted pacemaker patients. If possible, place paddles away from internal pacemaker generator to help prevent damage to the pacemaker.

Patients with implanted defibrillators. Apply paddles in the preferred placement, APEX-STERNUM (anterior-lateral), and treat this patient as any other patient requiring emergency care. If defibrillation is unsuccessful, it may be necessary to increase the energy level or to use the alternate electrode placement (anterior-posterior) due to the insulative properties of implanted defibrillator electrodes.



Standard paddle APEX-STERNUM (anterior-lateral) placement.

STANDARD PADDLES DEFIBRILLATION PROCEDURE

Refer to Standard Paddles Monitoring Procedure, page 9, for monitoring information.

1. Apply defibrillation gel over entire paddle electrode surface.
2. Turn defibrillator/monitor **1** POWER switch to a power source.
3. Select energy to be delivered with **2** ENERGY select dial. Device will not charge if a position between numbered settings is selected.
4. Push and release **3** CHARGE on APEX paddle. CHARGE indicator light flashes, numbers scroll up under AVAILABLE ENERGY display until energy reaches preselected level, and a single tone sounds when charge is complete.
5. Place defibrillator paddles firmly on patient's chest.
6. Make certain all personnel, including operator, are clear of patient, bed, and any equipment that might be connected to patient.
7. Discharge defibrillator by simultaneously pushing both paddle discharge buttons. The defibrillator will not discharge until it completes charging to the selected energy level.

   If paddle discharge buttons are not pressed within 60 seconds, stored energy discharges internally.
8. Observe patient and cardioscope to determine results. If additional countershock is necessary, repeat from step 3.
9. To internally dump an unwanted charge, rotate ENERGY select dial.
10. To turn off defibrillator, turn **1** POWER to OFF position.
11. Thoroughly clean defibrillator paddles and store them in paddle storage area.

    If ENERGY select dial is changed after charge is initiated, the AVAILABLE ENERGY display blanks, the charge indicator light goes out, and energy is dumped internally. Operator may reinitiate charge by pushing **3** CHARGE.

Using Pediatric Paddles

1. Slide pediatric paddles over clean standard paddles. An audible click will be heard when fully engaged.
2. Apply defibrillation gel to pediatric paddle electrode surface and place in the standard defibrillation position.
3. Select appropriate energy for size/age of child per AHA recommendations (or equivalent guidelines).
4. Follow Standard Paddles Defibrillation Procedure, page 15.

Using the Posterior Paddle

1. Slide the posterior paddle over clean, standard APEX paddle. An audible click will be heard when fully engaged.
2. Apply defibrillation gel to posterior paddle electrode surface.
3. Apply defibrillation gel to STERNUM paddle electrode surface.
4. Follow Standard Paddles Defibrillation Procedure, page 15.

WARNING

Important: For additional applicable safety information, refer to Appendix A, page 53.

- **Possible improper synchronization.** Monitoring the ECG through the standard paddles (QUIK-LOOK monitoring) could introduce artifact and lead to improper synchronization during cardioversion. Always use the patient cable and ECG electrodes or the FAST-PATCH system to monitor ECG during synchronized cardioversion.

MONITORING DURING SYNCHRONIZED CARDIOVERSION

There are two ways to monitor ECG for synchronized cardioversion:

- Use ECG cable and electrodes and select Lead I, II, or III.
- Use the FAST-PATCH adapter and FAST-PATCH disposable defibrillation/ECG electrodes. Refer to FAST-PATCH Adapter, page 18.

For proper synchronization, ECG SIZE must be adjusted correctly.

Observe cardioscope. Sync markers should occur with each QRS complex. If markers do not appear or appear elsewhere on the ECG signal, adjust ECG SIZE ▲ or ▼ until markers occur within the QRS complex. If this is not successful, select another lead or reposition the ECG electrodes.

Sync markers indicate the time of QRS detection used to synchronize discharge of the defibrillator. Markers may appear to move slightly from complex to complex; this is normal.

Occasionally, sync markers may occur near the end of the QRS complex. Adjust ECG SIZE to move marker closer to the middle of the QRS complex.

Asynchronous defibrillation mode is automatically selected when defibrillator is powered on. Device automatically returns to asynchronous mode after each discharge.

SYNCHRONIZED CARDIOVERSION PROCEDURE

If using FAST-PATCH defibrillation electrodes refer to Synchronized Cardioversion Procedure with FAST-PATCH Electrodes, page 21.

1. Turn defibrillator/monitor **1** POWER switch to a power source.
2. Attach ECG cable and ECG electrodes. For proper placement of electrodes refer to ECG Cables-Leads and Color Coding, page 10.
3. Select lead with optimum QRS complex amplitude (positive or negative).
4. Push SYNC. SYNC message on status display blinks off with each detected QRS complex.
5. Observe cardioscope. Adjust ECG SIZE ▲ or ▼ so sync markers occur only on the QRS complex.
6. Prepare and position paddles on patient's torso. Refer to Standard Paddles Defibrillation Procedure, page 15.
7. Select energy to be delivered with **2** ENERGY select dial. Device will not charge if a position between numbered settings is selected.
8. Push **3** CHARGE to charge defibrillator. A single tone sounds when charge is complete. Make certain all personnel, including operator, are clear of patient, bed, and any equipment that might be connected to patient.
9. Push and **hold** paddle discharge buttons until discharge occurs with next detected QRS complex. Release discharge buttons.
10. Observe patient and cardioscope. If synchronized cardioversion needs to be reattempted, push SYNC again. (Device automatically returns to asynchronous mode after each discharge.)
11. To internally dump an unwanted charge, rotate ENERGY select dial.
12. To turn off defibrillator, turn **1** POWER to OFF position.
13. Thoroughly clean paddles and store them in storage area.

The FAST-PATCH adapter enables the LIFEPAK 10 defibrillator/monitor to use FAST-PATCH disposable defibrillation/ECG electrodes for ECG monitoring, defibrillation and synchronized cardioversion. The adapter may be left in place for future use with FAST-PATCH electrodes.

Standard paddles are available at all times. Simply remove from the adapter.

WARNINGS

Important: For additional applicable safety information, refer to Appendix A, page 53.

- **Possible burns and ineffective energy delivery.** Use of disposable defibrillation electrodes which are dried out or damaged may cause electrical arcing and patient skin burns during defibrillation. To help prevent drying, do not use electrodes if:
  - -beyond expiration date
  - -package is unsealed
  - -package has been opened longer than 24 hours
  - -protective liner has been removed from electrodes for more than 30 minutes

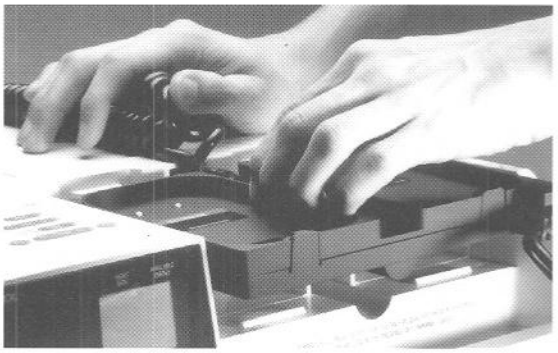
  To help prevent damage:
  - -do not crush electrodes under heavy objects
  - -do not autoclave, gas sterilize, immerse in fluids, or clean electrodes with alcohol or solvents.

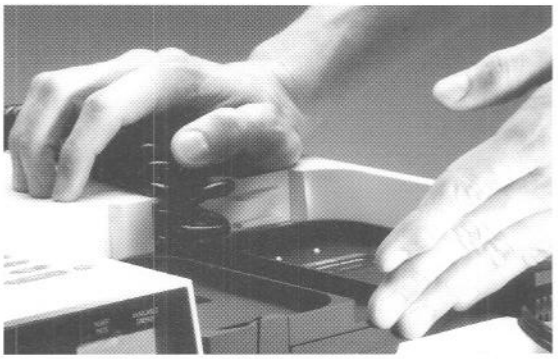
  Inspect electrodes to make sure the gel is not torn, split, or separated from metal backing. Do not use conductive gel, paste, or gel pads with disposable defibrillation electrodes.
- **Possible cable damage and ineffective defibrillation energy delivery or loss of monitoring.** Stretching or improper disconnection of the defibrillation cable can cause cable damage which may not be visible. To help prevent cable damage, follow the connection and disconnection procedures, page 19. Do not jerk the cable strain relief when removing the snap connector from the electrode posts. Position the defibrillation cable so it will not be pulled, snagged, or tripped over during use.
- **Possible shock, burns and ineffective energy delivery.** Do not substitute ECG electrodes or pacing electrodes for disposable defibrillation electrodes.
- **Possible electrode damage and patient skin burns.** Do not try to reposition the defibrillation electrodes after they have been applied to the patient. This may damage the adhesive and cause patient skin burns during defibrillation. If the position must be changed, remove and discard electrodes and replace with new ones.
- **Possible fire, burns and ineffective energy delivery.** Do not place standard paddles, gel, paste, or defibrillation gel pads in contact with disposable defibrillation electrodes.

INSTALLATION/REMOVAL OF FAST-PATCH ADAPTER

To install:

1. Remove standard paddles from paddle storage area.
2. Slide FAST-PATCH adapter into the paddle well.
3. Place standard paddles into FAST-PATCH adapter. The APEX paddle is placed on the right side and the STERNUM paddle on the left side. A click will be heard as paddle locks into position. Be certain standard paddles are securely placed within the wells of the adapter.





To remove:

1. Grasp both handles and pull up on rear of paddles and remove from adapter. There will be an audible click as paddles release from adapter.
2. Slide FAST-PATCH adapter out of defibrillator paddle storage area.
3. Slide standard paddles into storage area.

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ABOUT FAST-PATCH ELECTRODES

FAST-PATCH Defibrillation Electrode Description

FAST-PATCH disposable defibrillation/ECG electrodes are a pre-gelled, self-adhesive alternate to standard paddles. They adhere to the patient's torso, allowing ECG monitoring, hands-free defibrillation and synchronized cardioversion.

FAST-PATCH disposable defibrillation electrodes are not sterile.

Except for the metal connection post the electrodes are radiolucent.

Use of the FAST-PATCH Electrodes

FAST-PATCH electrodes are intended for a single patient application. Once applied they should not be moved.

One electrode set can be used for up to 50 shocks and can remain on the patient for 24 hours.

The positioning of the electrodes is very important. Refer to placement sections below. The cable connectors, however, labeled STERN (–) and APEX (+) may be connected to either electrode for defibrillation.

When using FAST-PATCH electrodes, make sure electrodes:

- Fit completely on the chest
- Have at least 1 inch of space between electrodes
- Do not overlap bony prominences of sternum or spine

Electrodes may be used on pediatric patients as long as they meet the placement conditions noted directly above. These conditions can normally be met with children weighing 10kg (22 lbs) or more.

Store in cool, dry location.

APEX-STERNUM (anterior-lateral) Placement

This is the preferred defibrillation electrode placement and allows for Lead II monitoring when PADDLES lead is selected.

1. Remove all clothing from patient's torso.
2. Clip or shave excessive torso hair. Use caution to avoid nicking or cutting skin. Placing defibrillation electrodes over broken skin may increase the likelihood of skin irritation or burns.
3. Clean and dry skin. If ointment is on patient's torso, use soap and water to clean skin. Briskly wipe skin dry with a towel or gauze to mildly abrade skin and remove oils, dirt, etc. This improves adhesion of electrode gel and adhesive ring.

   Do not use alcohol, tincture of benzoin, or antiperspirant to prepare skin.
4. Place two fingers directly under electrode post for support. With the other hand, place defibrillation cable snap connector directly on electrode post and press down to snap in place. The defibrillation cable snap connectors are labeled APEX and STERN.
5. Starting from electrode connection end, *slowly* peel back protective liner on electrode.
6. Place defibrillation electrode (STERN cable connector) on patient's upper right torso below the clavicle. Refer to Figure A.
7. Place defibrillation electrode (APEX cable connector) lateral to the patient's left nipple in the midaxillary line. Refer to Figure A.

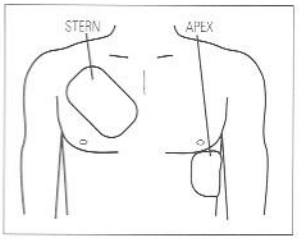


Figure A. APEX-STERNUM (anterior-lateral) placement.

8. Use flat surface of open hand to smooth electrode center and edges onto torso. Confirm there are no air pockets between gel surface and skin. Use fingers to firmly press all adhesive edges to skin.
9. Select PADDLES lead. This will display a Lead II monitoring signal.
10. To disconnect defibrillation cable from electrode on patient, press down with fingers on electrode area around the post to stabilize.
11. Pinch snap connector with the other hand and pull straight up. Refer to Figure B.

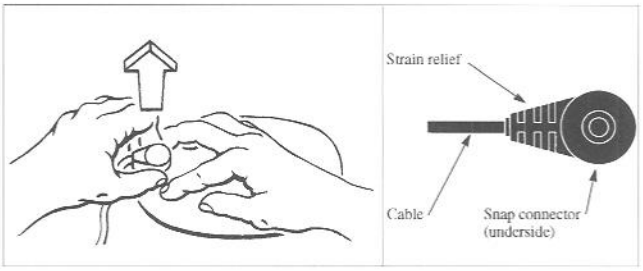


Figure B. Disconnecting the defibrillation electrode.

Improper disconnection or stretching of the defibrillation cable can cause cable damage which may not be visible.

12. If replacing electrodes, change position slightly to avoid placing electrodes over irritated skin.
13. Remove electrodes by slowly peeling them from patient's skin.

Anterior-Posterior Placement

Anterior-posterior placement is an alternate position for defibrillation, but not for monitoring. The ECG signal obtained through defibrillation electrodes in this position is not a standard lead. If anterior-posterior defibrillation electrode placement is used for synchronized cardioversion, always use the ECG cable and ECG electrodes. Select Lead I, II, or III, and follow anterior-lateral FAST-PATCH electrode placement on page 19, replacing steps 6 and 7 with 6A and 7A below (or use the alternate anterior-posterior placement described on page 15.)

6A. Place anterior electrode (cable connector labeled STERN) anteriorly over the left precordium. The upper edge of electrode should be below the nipple. Avoid placement over the nipple, the diaphragm or the bony prominence of the sternum if possible. Refer to Figure C.

7A. Place posterior electrode (cable connector labeled APEX) posteriorly behind the heart in the infrascapular area. For patient comfort, orient cable/post connection away from spine. Do not place electrode over bony prominences of the spine or scapula. Refer to Figure C.

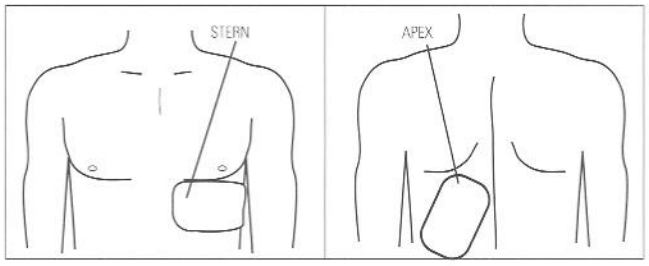


Figure C. Anterior-posterior placement.

Special Placement Situations

Obese patients. If possible, apply defibrillation electrodes to a flat area on torso. If fatty rolls preclude good adhesion, spread tissue apart to create a flat surface.

Thin patients. Follow contour of the ribs and spaces when pressing defibrillation electrode onto torso. This limits creation of air pockets under electrode and promotes good skin contact.

Implanted pacemaker patients. If possible, place defibrillation electrodes away from internal pacemaker generator.

Patients with implanted defibrillators. Apply defibrillation electrodes in the preferred placement APEX-STERNUM (anterior-lateral), and treat this patient as any other patient requiring emergency care. If defibrillation is unsuccessful, it may be necessary to try alternate electrode placements (anterior-posterior) due to the insulative properties of implanted defibrillator electrodes.

MONITORING PROCEDURE WITH FAST-PATCH ELECTRODES

Connect cable to FAST-PATCH electrodes as described in the APEX-STERNUM (anterior-lateral) Placement, page 19.

1. Turn defibrillator/monitor **1** POWER switch to a power source.
2. Select PADDLES lead.
3. Observe cardioscope. (APEX-STERNUM electrodes placement displays Lead II. Anterior-posterior electrode placement does not display a Lead II signal.)

DEFIBRILLATION PROCEDURE WITH FAST-PATCH ELECTRODES

Standard paddles must be secured in FAST-PATCH adapter during entire hands-free defibrillation procedure.

Connect cable to FAST-PATCH electrodes and apply electrodes as described in the APEX-STERNUM (anterior-lateral) Placement, page 19.

1. Turn defibrillator/monitor **1** POWER switch to a power source.
2. Select energy to be delivered with **2** ENERGY select dial. Device will not charge if a position between numbered settings is selected.
3. Push **3** CHARGE to charge defibrillator. A single tone sounds when charge is complete. Make certain all personnel, including operator, are clear of patient, bed, and any equipment that might be connected to patient.
4. Discharge defibrillator by simultaneously pushing both paddle discharge buttons.

5. Observe patient and cardioscope. If additional countershock is necessary, repeat from step 2.
6. To internally dump an unwanted charge, rotate ENERGY select dial.

SYNCHRONIZED CARDIOVERSION PROCEDURE WITH FAST-PATCH ELECTRODES

Standard paddles must be secured in FAST-PATCH adapter during entire hands-free synchronized cardioversion procedure.

Connect cable to FAST-PATCH electrodes and apply electrodes as described in the APEX-STERNUM (anterior-lateral) Placement, page 19.

1. Turn defibrillator/monitor **1** POWER switch to a power source.
2. Select PADDLES lead when using the anterior-lateral placement. When using anterior-posterior placement during synchronized cardioversion, use an ECG cable and select Lead I, II, or III.
3. Push SYNC. SYNC message on status display will blink off with each detected QRS complex.
4. Observe cardioscope. Adjust ECG SIZE ▲ or ▼ so sync markers occur only on the QRS complex.

   If a clear ECG trace does not occur with the FAST-PATCH electrodes, connect the ECG cable and ECG electrodes and select Lead I, II, or III.
5. Select energy to be delivered with **2** ENERGY select dial. Device will not charge if a position between numbered settings is selected.
6. Push **3** CHARGE to charge defibrillator. A single tone sounds when charge is complete. Make certain all personnel, including operator, are clear of patient, bed, and any equipment that might be connected to patient.
7. Push and **hold** paddle discharge buttons until discharge occurs with the next detected QRS complex. Release discharge buttons.
8. If synchronized cardioversion needs to be reattempted, push SYNC again. (Device automatically returns to asynchronous mode after each discharge.)
9. To internally dump an unwanted charge, rotate ENERGY select dial.

TRANSFER BETWEEN LIFEPAK DEFIBRILLATOR/ MONITORS

When patient care is transferred between LIFEPAK defibrillators that are both equipped to use FAST-PATCH electrodes, the electrodes may remain on the patient.

To disconnect cable from electrode: follow steps 10 and 11 in the APEX-STERNUM (anterior-lateral) Placement, page 19.

To reconnect cable to electrode:

1. Place a finger tip directly under electrode post for support. The adhesive edge should only lift slightly. Do not touch gel.
2. With the other hand, place snap connector directly on electrode post and press down to snap in place. Refer to Figure D.
3. Firmly press adhesive edge back onto skin.

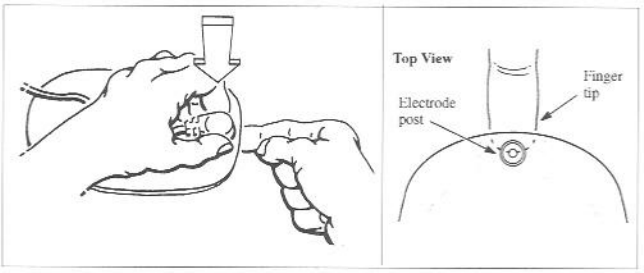


Figure D. Reconnecting the defibrillation electrode.

The LIFEPAK 10 defibrillator/monitor with optional pacemaker is designed for demand mode pacing. Follow usual protocols for patients requiring noninvasive pacing including support of airway, breathing and circulation, and drug therapy.

Proper functioning of the demand mode pacemaker is dependent on correct operator adjustment of the ECG SIZE to allow sensing of intrinsic cardiac activity. The LIFEPAK 10 defibrillator/monitor senses intrinsic QRS activity and inhibits the pacing stimulus for the cycle. If QRS activity is not sensed because ECG size is set incorrectly or ECG leads are detached, device paces asynchronously at the selected rate.

The Pacing Procedure on page 25 outlines proper electrode placement and cable connections. Follow the procedure; misplacing the electrodes or reversing the pacing cable connectors can make a significant difference in capture threshold.

For further information regarding noninvasive pacing refer to the "Noninvasive Pacing: What You Should Know" booklet. See page 52 for order information.

WARNINGS

Important: For additional applicable safety information, refer to Appendix A, page 53.

- **Possible interruption of therapy**. Do not leave patient unattended while pacemaker is in use. Observe the patient continuously to assess any changes in patient response to pacing therapy.
- **Possible skin burns and ineffective pacing therapy**. Use of pacing electrodes which are dried out or damaged may cause electrical arcing and patient skin burns during pacing. To help prevent drying or damage, do not use pacing electrodes if they have been removed from the foil package for more then 24 hours or if the protective liner has been removed for more than 60 minutes. Do not use electrodes beyond expiration date. Inspect electrodes to make sure adhesive is intact and undamaged.
- **Possible inhibition of pacing therapy**. Do not substitute ECG electrodes or defibrillation electrodes for pacing electrodes.
- **Possible patient skin burns during prolonged pacing**. Prolonged noninvasive pacing may cause patient skin irritation and burns, especially with higher pacing current levels. Discontinue noninvasive pacing if skin becomes irritated and another method of pacing is available.
- **Possible improper pacing**. The ECG size must be properly adjusted in order to detect intrinsic complexes and deliver pacing pulses when appropriate. If ECG size is set too high or too low, pacing pulses may not be delivered when required.
- **Possible interruption of therapy**. If PADDLES lead is selected during pacing, the pacing current output is reduced to 0mA and pacing therapy stops.
- **Possible interruption of therapy**. Use of radio transmitters while pacing may cause pacing therapy to stop. To minimize radio interference, move radio farther away from defibrillator/monitor. If unable to move radio away, reorient the radio.

ECG MONITORING DURING PACING

Monitoring during pacing must be done through ECG electrodes and the ECG cable rather than through the paddles. During pacing, the cardioscope displays pace markers followed by any resultant QRS complexes. The recorder annotates pacing information and documents each delivered pacing stimulus with a bold faced arrow (↑) immediately below the stimulus. Monitoring or recording from systems other than the LIFEPAK 10 defibrillator/monitor may be difficult due to the large offsets produced by pacing currents.

The following information may be useful in obtaining the best ECG display possible.

- Use a Physio-Control ECG cable.
- Be sure skin beneath ECG electrode sites is dry and excessive hair is shaved or clipped. Refer to Skin Preparation, page 9.
- Apply ECG electrodes: RA to patient's far upper right torso beneath the clavicle; LA to far upper left torso beneath the clavicle; LL to lower left torso. These locations may minimize ECG artifact due to motion.
- Select Lead I, II, or III for the most prominent QRS display.

ABOUT QUIK-PACE ELECTRODES

Pacing electrodes are an important part of the pacing system. They are constructed of materials specifically designed to produce uniform current density and minimize patient discomfort.

Pacing electrodes are designed for patients weighing more than 15kg (33 lbs).

Make sure pacing electrodes: 1) fit completely on torso, 2) have a minimum of 1-2 inches of space between electrodes, and 3) do not overlap bony prominences of the sternum or spine.

Conscious patients may experience discomfort during pacing. Sedation and/or analgesia may be needed prior to pacing.

Placement of pacing electrodes affects current threshold and may affect patient comfort. Avoid placing the negative electrode in the posterior position or at the right upper anterior chest, as this may cause a higher current capture threshold and more patient discomfort.

Store pacing electrodes in a cool, dry location. They are not sterile, and are not designed to be autoclaved or gas sterilized.

PACING ELECTRODE PLACEMENT

Anterior-Posterior Placement (preferred)

The preferred placement of the pacing electrodes is anterior-posterior. This position is less likely to cause pectoral muscle stimulation and does not interfere with placement of defibrillation paddles or defibrillation electrodes.

1. Remove all clothing from patient's torso. Do not place electrodes over tape or bandages.
2. Clip or shave excessive torso hair. Avoid nicks or cuts to skin which may increase patient discomfort.
3. Clean and dry skin. Briskly wipe skin dry with towel or gauze to abrade skin and remove oils, dirt, etc. If ointments are on torso where electrodes will be applied, remove with soap and water. Do not use alcohol or tincture of benzoin to prepare skin.
4. Remove paper covering from each electrode post.
5. Firmly press cable connector onto electrode post. **Match electrode color to cable connector color, red to red and black to black.**
6. Remove protective liner from electrode.
7. Place the black ANTERIOR (–) electrode on the left anterior torso, halfway between the xiphoid process and the left nipple at apex of the heart. The upper edge of electrode should be below the nipple. This corresponds to V_2-V_3 ECG position, refer to Figure A. Avoid placement over the nipple, diaphragm or sternum, if possible.
8. Place red POSTERIOR (+) electrode on left posterior torso beneath the scapula and lateral to the spine at heart level. Avoid placement over the bony prominences of the spine or scapula. Refer to Figure A.
9. Firmly press electrode center and edges onto torso for proper adhesion.
10. Replace electrodes after 24 hours.

    If necessary, change position slightly to avoid placing electrode over irritated skin.
11. To remove electrodes from skin, slowly peel back from the edge and discard.

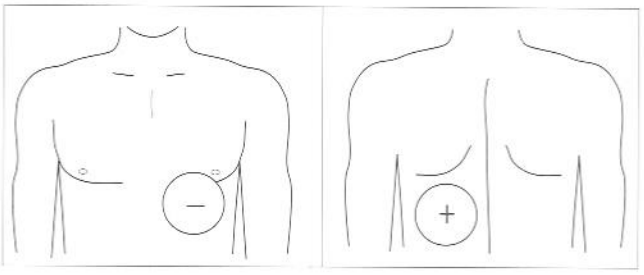


Figure A. Anterior-posterior pacing electrode placement.

Anterior-Lateral Placement (alternate)

If anterior-posterior placement is contraindicated, the alternate anterior-lateral placement may be used. Follow the steps for anterior-posterior placement, replacing steps 7 and 8 with 7A and 8A below.

7A. Place the black ANTERIOR (–) electrode on the left anterior torso, just lateral to the left of the nipple in the midaxillary line. This corresponds to V_6 ECG position. Refer to Figure B.

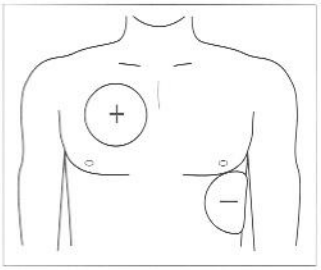


Figure B. Anterior-lateral pacing electrode placement.

8A. Place the red POSTERIOR (+) electrode on the right anterior upper torso subclavicular area lateral to the sternum. Refer to Figure B.

Special Placement Situations

Patients with large breasts. It may be necessary to place the black ANTERIOR (–) electrode, when using anterior-posterior placement, closer to V_2 rather than V_3.

Obese patients. Place electrodes over a flat area if possible. If fatty rolls preclude good electrode adhesion, spread the tissue apart.

Thin patients. Follow contour of the ribs and spaces between the ribs when pressing electrode in place.

RESPONSE TO NONINVASIVE PACING

Externally applied pacing stimuli may produce skeletal muscle contractions. It may be necessary to secure tubing, cables, etc. to prevent their displacement.

When using noninvasive pacing on unconscious patients, the patient's level of consciousness may improve during pacing. Patient discomfort associated with noninvasive pacing may occur. Discomfort may be minimized by administration of a sedative or analgesic or movement of the anterior (negative) pacing electrode to the V_6 electrode position or to the epigastric area. Repositioning of the negative pacing electrode may result in a lower capture threshold, thus reducing discomfort.

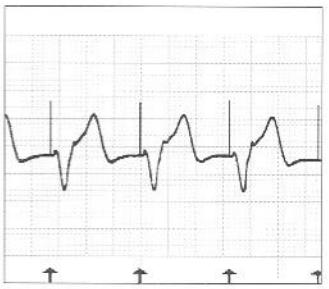
If pacing electrodes remain in place 24 hours, remove them and apply a new set, adjusting the position slightly.

ASSESSING FOR CAPTURE

During pacing, the patient should be visually monitored at all times, and should be assessed for both electrical and mechanical (ventricular) capture. Skeletal muscle twitching should be expected, but it is not an indication of pacing capture.

It may be difficult to interpret the ECG signal when pacing at a rapid rate. In some patients the ECG signal may be easier to interpret in Lead I.

Electrical capture stimulated by noninvasive pacing is evidenced by a wide (>120ms) QRS complex followed by a tall, broad T-wave. The QRS complex can be a positive (upward) or negative (downward) deflection. In either case, *the most distinctive evidence of electrical capture is the presence of a tall broad T-wave.* It is much like capture seen in temporary transvenous or permanent pacing. In some patients, capture may be less obvious, noted only as a change in QRS configuration.



ECG recording strip of electrical capture.

Mechanical or ventricular capture is evidenced by signs of improving cardiac output. Palpate for a carotid or femoral pulse (right side preferred) and check color and temperature of skin. Check for improving blood pressure and level of consciousness.

ECG Distortion During Pacing

ECG electrodes pick up pacing current, therefore, ECG distortion during pacing is sometimes evident. It is important to distinguish between electrical capture and ECG distortion from pacing current to avoid misinterpretation.

ECG distortion may occur immediately following the pacing stimulus. ECG distortion morphology is variable, however, *ECG distortion without electrical capture returns to the ECG baseline without evidence of a T-wave.*

If ECG distortion is severe, select another lead or reposition ECG electrodes away from pacing electrodes.

If the patient has intrinsic QRS complexes, the pacing pulse may blank part or all of any complex which occurs within 40ms of the pulse.

Pacemaker Refractory Period

The LIFEPAK 10 pacemaker has a refractory period which is a brief, variable (rate dependent) period of time following the pacing pulse in which the pacemaker will not sense electrical activity. The presence of the refractory period allows the set pacing rate to be maintained. Intrinsic activity which occurs during the pacemaker's refractory period will not be sensed.

PACING PROCEDURE

1. Turn defibrillator/monitor **1** POWER switch to a power source.
2. Connect ECG electrodes to ECG cable and apply to patient. Refer to Skin Preparation, page 9.
3. Connect pacing cable to PACE connector on side of defibrillator/monitor.
4. Connect pacing electrodes to pacing cable and position electrodes on patient. Refer to Pacing Electrode Placement, page 23. **Match electrode color to cable connector color, red to red and black to black.**
5. Push PACER. Adjacent indicator illuminates.
6. Select desired pacing rate. (Pacemaker powers up at a rate of 40 bpm.)
7. Observe cardioscope. Sense marker should appear on each QRS complex. If sense marker is not present on QRS or appears elsewhere, adjust ECG SIZE. If this fails, select another lead and readjust ECG SIZE. If intrinsic beats are not present, omit this step.
8. When the device is sensing properly, activate pacing by pushing START/STOP. Adjacent indicator flashes off and a positive pace marker shows on the ECG display with each delivered pacing stimulus.
9. Increase current slowly (current level begins at 0mA). Consider use of sedation or analgesia if patient is uncomfortable. Observe cardioscope for evidence of electrical pacing capture. Palpate patient's pulse or check blood pressure to assess for perfusion (mechanical capture).
10. When activated, recorded ECG and CODE SUMMARY record document pacing parameters. Each pacing stimulus is marked with an arrow (↑) on the lower edge of ECG paper.
11. To stop pacing, push START/STOP again or push PACER. Adjacent indicator lights go out.
12. To remove pacing electrodes from skin, slowly peel from edge.

Possible Causes of Pacing Interruption

If the pacing cable or a pacing electrode becomes detached during pacing, the LEADS message displays on the status display along with an audible alarm. The pacing rate maintains its pre-alarm setting, however, current resets to 0mA. Reattaching the pacing cable or pacing electrode silences the audible alarm. The LEADS message is removed and pacing rate is maintained, but current remains at 0mA unless increased.

Pacing therapy cannot be initiated or maintained in PADDLES lead. If PADDLES lead is selected when cycling through leads during pacing, current returns to 0mA and pacing therapy stops. If PADDLES lead is selected and pacing is attempted, the LEADS message displays accompanied by tones.

Use of radio equipment while pacing may cause current delivery to stop and the service message and tones to appear. To minimize radio interference, move radio farther away from defibrillator/monitor. If unable to move radio away, reorient the radio. Push PACER to stop tones and erase service message. To reinstate pacing, follow Pacing Procedure beginning with step 6.

DEFIBRILLATION DURING NONINVASIVE PACING

1. Apply defibrillation gel to paddles.
2. Select energy to be delivered with **2** ENERGY select dial. Device will not charge if a position between numbered settings is selected.
3. Push and release **3** CHARGE on APEX paddle.

   When CHARGE is pushed, pacing stops immediately (pacing control settings return to 40 bpm and 0mA), and lights adjacent to PACER and START/STOP buttons go out. The HEART RATE display measures the patient's intrinsic rate in beats per minute and the AVAILABLE ENERGY display confirms selected energy in joules.
4. Follow Standard Paddles Defibrillation Procedure, page 15.

   It is not generally necessary to remove pacing electrodes during defibrillation since positioning of standard paddles differs from that of pacing electrodes. If pacing electrodes interfere with paddle or defibrillation electrode placement, remove pacing electrodes.

The 12 Lead ECG Adapter allows the LIFEPAK 10 defibrillator/monitor to obtain serial, diagnostic quality 12 lead ECG recordings. The adapter plugs into the monitor's ECG connector. The adapter has a 10 lead ECG cable and lead selector dials which are used to select the desired ECG leads.

WARNINGS

Important: For additional applicable safety information, refer to Appendix A, page 53.

- **Possible inaccurate 12 lead ECG recordings.** If the diagnostic frequency response mode (DIAG) is not enabled, recorded 12 lead ECG data will be inaccurate.
- **Possible inaccurate 12 lead ECG information.** Use the 12 Lead ECG Adapter only with the LIFEPAK 10 defibrillator/monitor.

Using DIAG Mode

DIAG mode must be selected to record or transmit 12 Lead ECGs. A LIFEPAK 10 defibrillator/monitor used with the 12 Lead ECG Adapter records diagnostic quality ECG only when DIAG mode is enabled and selected. Select the desired notch filter (50Hz or 60Hz) to reduce signal noise. Refer to Section 2 of the Service Manual for procedure.

The signal available at the LIFEPAK 10 defibrillator/monitor AUX connector (for ECG transmission) will be of diagnostic quality if defibrillator/monitor is operated in DIAG mode. However, the ability to transmit diagnostic quality ECG depends on the systems used for transmitting and receiving. Operators who wish to transmit diagnostic ECG are advised to discuss transmission set-up with qualified representatives of the transmission systems used.

OBTAINING QUALITY 12 LEAD ECGS

It is important that the patient be lying down and comfortably positioned before the 12 Lead is recorded. Good quality electrodes and good skin preparation are essential to obtain a clean, stable ECG trace.

Diagnostic frequency response is more susceptible to interference than monitor frequency response (agency or domestic). Care should be taken to reduce sources of noise such as muscle tremor, respiratory or other patient motion, motion of the ECG cable, 60Hz or other electrical interference.

Move patient and defibrillator/monitor away from sources of electrical interference such as power cables, wall outlets, etc.

A small amount of sporadic or low level ECG noise may be unavoidable and within acceptable limits.

12 LEAD ECG PROCEDURE

1. Attach 12 Lead ECG Adapter to LIFEPAK 10 defibrillator/monitor ECG connector.
2. Snap ECG electrodes onto the 10 lead ECG cable.
3. Prepare patient's skin for electrode placement. Refer to Skin Preparation, page 9.
4. Apply ECG electrodes to patient as shown in Figure A.

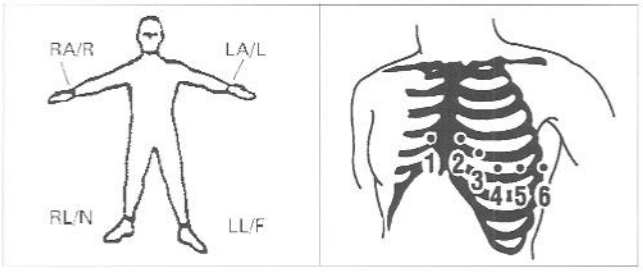


Figure A. Limb Leads and V Leads (Chest Leads)
AHA and IEC lead placements respectively.

5. Select Lead II on the LIFEPAK 10 defibrillator/monitor using LEAD SELECT (Leads I and III will not work).
6. Select STD on 12 Lead ECG Adapter.
7. Push and **hold** RECORD until DIAG appears in the right corner of the status display.
8. Push CAL on the monitor to display and record a 1mV signal. This should be repeated any time the ECG SIZE is changed. The selected gain is annotated on the recording. The recommended gain setting is x1.
9. Select the desired leads using the dials on the adapter.

   When using the LIFEPAK 10 defibrillator/monitor in diagnostic mode, ECG lead position is not annotated on recorded strip. Lead II displays on the LIFEPAK 10 defibrillator/monitor status display. When using the adapter the lead selected is indicated by the dials on the adapter.

   The V Leads are only available when the LIMB LEADS switch is in the V Leads position.

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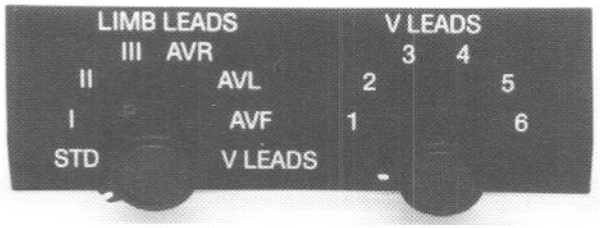


12 Lead Adapter.

10. Mark selected lead on ECG paper.

    Recorded ECG is delayed three seconds from real time.

11. Push RECORD to exit diagnostic mode.
    DIAG no longer is displayed on status display.
    Recorder stops.

The LIFEPAK 10 defibrillator/monitor uses Nickel-Cadmium (NiCad) batteries. These NiCad batteries must be properly maintained using the Battery Support System to maximize battery life and performance.

Use only Physio-Control batteries and battery chargers with Physio-Control devices. Use only the Battery Support System for battery maintenance.

WARNINGS

Important: For additional applicable safety information, refer to Appendix A, page 53.

- **Possible loss of power during patient care.** Using an improperly maintained battery to power the defibrillator/monitor may cause premature power loss. Use the Battery Support System to properly maintain batteries.
- **Possible loss of power during patient care.** Stored batteries lose charge. Failure to charge a stored battery before use may cause premature defibrillator/monitor power loss. Always charge a stored battery before returning it to active service.
- **Possible loss of power during patient care.** Physio-Control has no information regarding the performance or effectiveness of its LIFEPAK defibrillator/monitors if they are used with non-Physio-Control batteries or battery chargers. Using non-Physio-Control batteries or battery chargers may result in device failure and may void warranty. Use only Physio-Control batteries and the Battery Support System.
- **Fire or explosion hazard.** The battery charger which accepts only two batteries (two-well Battery Charger, P/N 9-00284, 9-00288, or 801530) is not designed to charge FASTPAK batteries. Charging FASTPAK batteries in the two-well Battery Charger may reduce battery life and create a fire or explosion risk. Use only the Battery Support System to charge FASTPAK batteries.
- **Possible loss of power during patient care.** The two-well Battery Charger does not perform all the tests required to properly evaluate battery performance. Using an improperly maintained battery may result in defibrillator/monitor power loss. Use only the Battery Support System to maintain batteries.

BATTERY DESCRIPTION

Physio-Control FASTPAK, LIFEPAK 5 FASTPAK, or Battery Pak batteries can power the LIFEPAK 10 defibrillator/monitor. The batteries perform similarly but require different charge times:

- Either FASTPAK battery charges in the Battery Support System in approximately 70 minutes.
- The Battery Pak battery charges in the Battery Support System in approximately 4 1/2 hours.

NICAD BATTERY PERFORMANCE FACTORS

The following are three major factors which affect the performance of NiCad batteries.

Temperature

Charging a battery at temperatures below 20°C (68°F) or above 25.5°C (78°F) prevents the battery from reaching its full capacity and may lead to irreversible cell damage.

Voltage Depression

Voltage depression is a condition which reduces battery performance, particularly when charging the defibrillator. This condition is often mistakenly called memory. Voltage depression can usually be reversed by reconditioning the battery every 3 months. Voltage depression is caused by:

- Repeatedly attempting to add more charge to a fully charged or a nearly fully charged battery
- Extended charging at temperatures above 25.5°C (78°F)

Self-Discharge Rate

Like most batteries, NiCad batteries self-discharge when not used. A new NiCad battery self-discharges approximately 1% of its capacity each day when stored at room temperature. In 10 days a new NiCad battery not installed in the defibrillator/monitor loses approximately 10% of its capacity. The self-discharge rate of the battery can be evaluated by performing a Shelf Life Test, outlined on page 29. The actual battery self-discharge rate depends on:

- Battery age
- Temperature
- Frequency of use
- Length of time in storage
- Physical battery condition

The self-discharge rate increases as the battery ages. An older battery stored in higher temperatures may have an self-discharge rate much greater than 1% a day.

USING BATTERY SUPPORT SYSTEM

Use only the Battery Support System to maintain FASTPAK, LIFEPAK 5 FASTPAK, and Battery Pak batteries. Refer to Battery Support System Operating Instructions for complete information.

The AC and DC auxiliary power modules do not perform all the procedures required to properly maintain or evaluate battery performance. The primary use of AC and DC auxiliary power modules is to supply external power to operate the device.

Charge Batteries at the Proper Temperature

The optimum charging temperature is room temperature, or 20 to 25.5°C (68 to 78°F). Batteries charged outside room temperature may not reach full capacity even if the charge time is increased.

Location of the Battery Support System

Use the following guidelines for location of the Battery Support System:

- Place in a well-ventilated area.
- Keep at room temperature.
- Do not place in direct sunlight.
- Do not place near a heat source or an air conditioner.

Rotate Batteries

Rotate batteries so all batteries in active service are used equally.

Recondition Batteries Every Three Months

Reconditioning a battery helps prevent or reverse effects of voltage depression and helps to keep track of battery capacity. Reconditioning is a succession of discharge/charge cycles performed in the Battery Support System. Perform reconditioning every 3 months.

Perform Shelf Life Test Every Six Months

The Shelf Life Test evaluates the self-discharge rate of a stored battery. Perform the Shelf Life Test every 6 months, or alternate it with the Reconditioning Procedure every 3 months.

INSTALLING AND REMOVING A BATTERY

Inspect battery pins in the LIFEPAK 10 defibrillator/monitor or the Battery Support System for signs of damage before installing a fresh battery. Do not drop or force a battery into the battery well.

To install battery:

1. Align battery with battery well so battery clip is toward pins.
2. Insert end of battery opposite battery clip into battery well.
3. Press clip end of battery into battery well until a click is heard.

To remove battery, press battery clip and lift.

RECONDITIONING PROCEDURE

Place battery to be reconditioned in the DISCHG-CHARGE well of the Battery Support System.

1. CHARGE battery until READY light appears.
2. Push DISCHG-CHARGE.
3. When READY appears, push DISCHG-CHARGE again.
4. When READY appears, remove battery for 1-4 hours.
5. Reinstall battery. Push DISCHG-CHARGE again.
6. When READY displays, note battery capacity. (Log battery capacity on back of battery.)

If battery capacity after third discharge is 80% or greater, the battery is acceptable; return battery to service. If battery capacity is less than 80%, discard battery.

SHELF LIFE TEST PROCEDURE

Place battery to be tested in the DISCHG-CHARGE well of the Battery Support System.

1. Charge battery until READY light appears.
2. Push DISCHG-CHARGE.
3. When READY appears, push DISCHG-CHARGE again.
4. When READY appears, remove battery for 1-4 hours.
5. Reinstall battery. Push DISCHG-CHARGE again.
6. When READY displays, note battery capacity. (Log battery capacity on back of battery.)

   If battery capacity is 80% or greater continue to step 7. If battery capacity is less than 80%, discard battery.
7. Remove battery and store on a shelf for 7 to 8 days.

8. Reinstall battery in Battery Support System. Push DISCHG-CHARGE again. When READY displays, note battery capacity.
9. Subtract battery capacity (step 8) from battery capacity (step 6). This is the Shelf Life Test value. If test value is 20 or less the battery is acceptable; return battery to service. If test value is greater than 20, discard battery.

Battery Maintenance Forms

Physio-Control provides several tools to document battery maintenance. The Reconditioning Procedure and Shelf Life Test are available as adhesive pads. A separate Battery Maintenance Log is also available. See Appendix B, page 56, for examples and the Replacement Items and Accessories, page 51, to order.

RECEIVING NEW BATTERIES

When receiving newly purchased batteries, promptly label and recondition each one.

Label Batteries

Label each new FASTPAK or Battery Pak with a unique identification number so that it can be easily tracked through all maintenance and rotation.

Recondition New Batteries

Because NiCad batteries self-discharge, new batteries may not be fully charged when they arrive. Recondition newly purchased batteries.

STORING BATTERIES

Store batteries in the Battery Support System or on a shelf. Even in storage, batteries require routine maintenance. When storing on a shelf, store at the proper temperature.

- Store batteries between 4.4 and 26.7°C (40 and 80°F). Cooler temperatures reduce battery self-discharge rate.
- Do not freeze batteries. Damage to the battery may result.

DISCARDING/RECYCLING BATTERIES

When properly maintained, the Physio-Control FASTPAK and Battery Pak NiCad batteries should have a battery life of approximately two years. Discard a battery in an environmentally safe manner if any of the following circumstances occur:

- Less than 80% of the battery capacity remains after reconditioning.
- There is a difference of greater than 20 after performing a battery Shelf Life Test.
- There is physical damage to battery case.
- The Battery Support System indicates battery is faulty.

Recycle discarded NiCad batteries locally according to national, state, and local regulations. If local recycling is not possible, contact your Physio-Control representative.

Either of two modules (AC or DC) may be used to power the LIFEPAK 10 defibrillator/monitor when the use of batteries is not desirable. The two functions of the auxiliary module are to power the defibrillator/monitor and to offset the normal self-discharge rate of Physio-Control batteries installed in the device.

WARNING

Important: For additional applicable safety information, refer to Appendix A, page 53.

- **Possible device shutdown during patient care.** The AC and DC auxiliary power modules trickle-charge batteries installed in the defibrillator/monitor; they do not maintain batteries. Batteries can be maintained only by using the Battery Support System.

AC AUXILIARY POWER MODULE

The Physio-Control AC Auxiliary Power Module provides power to the defibrillator/monitor. It is also capable of slowly charging up to three Physio-Control batteries in 24 hours.

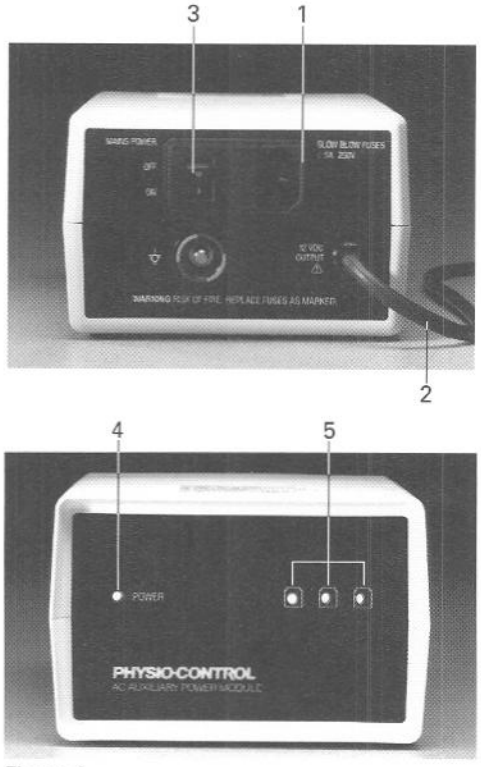


Figure A.

Operation

1. Remove the black plastic cap on defibrillator/monitor AUX connector before connecting power module cable (cap may be absent).
2. Connect power cord to rear of power module (See Figure A, #1), and plug the other end into a grounded hospital grade AC outlet.
3. Plug the attached cord (#2) into AUX connector on the side of the defibrillator/monitor.
4. Check POWER switch (#3) is placed in the **I** (on) position. When green POWER light (#4) illuminates, the power module is on and can supply power to the LIFEPAK 10 defibrillator/monitor.
5. Turn defibrillator/monitor **1** POWER switch to AUX to operate from AC power.

   The defibrillator/monitor can operate from AC power with the Auxiliary Power Module connected and no batteries installed.

   The amber lights (#5) illuminate when batteries are charging. A fully depleted battery is recharged in 24 hours.

   The auxiliary power module may be connected to the defibrillator/monitor at all times. The power module will not overcharge batteries.

DC AUXILIARY POWER MODULE

The Physio-Control DC auxiliary power module provides 12 volt power to the LIFEPAK 10 defibrillator/monitor. It is also capable of charging up to three Physio-Control batteries in 24 hours.

Cautions:

- **Possible loss of vehicle battery power**. When the DC auxiliary power module is connected to the defibrillator/monitor and a battery is installed, the power module continuously trickle-charges the battery, even while the defibrillator power is off. This trickle-charge continuously draws current from the DC power source such as a vehicle battery. To prevent draining vehicle battery power, be sure to disconnect the DC power source from the DC auxiliary power module whenever the vehicle will not be operated for an extended period of time (such as overnight).
- **Possible equipment damage**. Be sure to observe proper polarity when connecting the DC power source cable to the +12V DC power input and ground connectors at the rear of the DC auxiliary power module. Reverse polarity connections may damage the power module.

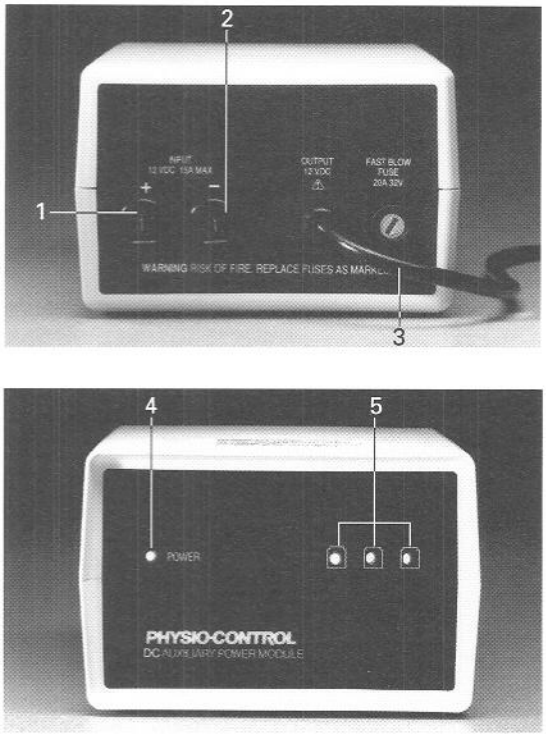


Figure B.

Operation

1. Remove black plastic cap on defibrillator/monitor AUX connector before connecting power module cable (cap may be absent).
2. Connect the positive cable from the 12 volt supply to the positive terminal on the auxiliary power module (See Figure B, #1). Connect the negative cable from the 12 volt supply to the negative terminal on the auxiliary power module (#2).

   Ten gauge wire is recommended for the cable coming from the 12 volt supply. This wire should not exceed 30 feet in length.
3. Plug the attached cord (#3), into the AUX connector on the side of the defibrillator/monitor.
4. When green POWER light (#4) illuminates, the power module is on and can supply power to the defibrillator/monitor.
5. Turn defibrillator/monitor **1** POWER switch to AUX to operate from DC vehicle power.

   The defibrillator/monitor can operate from DC vehicle power with the auxiliary power module connected and no batteries installed.
6. The amber lights (#5) illuminate when batteries are charging. A fully depleted battery is recharged in 24 hours.

   The auxiliary power module may be connected to the defibrillator/monitor at all times. Power module will not overcharge batteries.

Conduct routine testing of the LIFEPAK 10 defibrillator/monitor and accessories to detect possible electrical and mechanical problems, and keep personnel acquainted with normal operating procedure. Contact a qualified service technician if device or accessory discrepancies are noted. Refer to Maintenance and Testing Guidelines, page 50.

WARNINGS

Important: For additional applicable safety information, refer to Appendix A, page 53.

- **Shock hazard**. During defibrillation cable testing, the discharged energy passes through the cable snap connectors. Be sure that the cable connectors are securely attached to the testing device posts.
- **Possible loss of power during patient care.** Battery pins (connectors) in the LIFEPAK 10 defibrillator/monitor and the Battery Support System may be damaged if batteries are dropped or forced into battery wells. Inspect pins routinely for signs of damage.
- **Possible failure to deliver energy**. A defibrillation cable damaged by improper removal from a tester may cause a failure to deliver energy or loss of ECG signal during the next patient use. To avoid damaging the defibillation cable, do not disconnect cable snap connectors from tester posts by pulling on the defibrillation cable or twisting or bending the connectors off the tester posts. Disconnect the cable properly by pulling each cable connector straight out from the post as illustrated in Figure A on page 36.
- **Possible paddle damage and patient burns**. Press paddles firmly onto the Battery Support System test plates when discharging to prevent formation of pits on paddle surfaces. Pitted or damaged paddle plates can cause patient skin burns during defibrillation.

MONITOR/RECORDER

Equipment Needed

- LIFEPAK 10 defibrillator/monitor
- ECG cable
- PaceMate™ noninvasive pacing simulator

Testing Procedure

1. Turn defibrillator/monitor **1** POWER switch to a power source. The device will complete a self-test. The service indicator remains illuminated if self-test detects a fault.
2. Attach a 3 lead ECG cable to the ELECTRICALLY ISOLATED ECG CONNECTOR and attach the leads to a PaceMate simulator. The PaceMate simulator power should remain off.
3. Select Lead II on LIFEPAK 10 defibrillator/monitor.
4. Push QRS VOL ▲ 5 times.
5. Push and release CAL. Confirm that 1mV calibration pulse appears on cardioscope.
6. Turn on PaceMate simulator. Set PT Rate to 80. Confirm heart rate in status display reads 80 and QRS tones sound 80 times/minute. Confirm simulated normal sinus rhythm appears on the cardioscope.
7. Push FREEZE. Confirm trace on cardioscope stops.
8. Set PT Rate to 40 on PaceMate simulator.
9. Push RECORD. Verify recorder runs and ECG trace appears on the paper. After approximately 3 seconds, time, date, Lead II, ECG gain and heart rate annotate on the paper.

   Caution: Recorder will not run without paper. Use only paper designed for thermal array recorders. Use of any other ECG paper may damage print head.
10. Push RECORD to turn off recorder.
11. While in Lead II, verify removing either RA or LL leads results in loss of simulated ECG display.
12. Select Lead I. Confirm removing either RA or LA leads results in loss of simulated ECG display. Confirm removing the reference lead, LL, does not affect ECG display.
13. Select Lead III. Confirm that removing either LL or LA leads results in loss of simulated ECG display. Confirm removing the reference lead, RA, does not affect ECG display.
14. Select PADDLES lead. Confirm gentle paddle shaking results in interference on cardioscope. Confirm placing paddle electrode contacts together results in a flat line on cardioscope.

DEFIBRILLATOR

Equipment Needed

- LIFEPAK 10 defibrillator/monitor
- Battery Support System

Testing Procedure

1. Turn defibrillator/monitor **1** POWER switch to a power source.
2. Select PADDLES lead.
3. Push ▲ on the TEST LOAD SELECT to 360 joules on the Battery Support System (refer to Battery Support System Operating Instructions).
4. Position standard paddles so APEX and STERNUM paddles are centered on Test Load Plates. Paddle surfaces should not come in contact with any other surface of the Battery Support System.
5. Select 360 joules with **2** ENERGY select dial.
6. Push **3** CHARGE. Numbers in AVAILABLE ENERGY window in the status display scroll up to the selected energy in less than 12 seconds.
7. Push RECORD.
8. Push only the APEX discharge button and confirm defibrillator does not discharge.
9. Push only the STERNUM discharge button and confirm defibrillator does not discharge.
10. Apply firm pressure with both paddles on the TEST LOAD PLATES of the Battery Support System and discharge defibrillator by pushing both paddle discharge buttons simultaneously. Battery Support System displays delivered energy. If recorder is on, time, date, and energy selected are annotated on the ECG strip.

    Caution: Do not deliver more than 20 defibrillation pulses per hour at maximum energy, with no more than 15 occurring in any 5 minute period. This will help prevent heat build-up and subsequent damage to the Battery Support System.

Extensive or repeated testing of defibrillator will consume battery power. Battery recharging may be required.

SYNCHRONIZER FUNCTION

Equipment Needed

- LIFEPAK 10 defibrillator/monitor
- Battery Support System
- ECG cable
- PaceMate noninvasive pacing simulator

Testing Procedure

1. Turn defibrillator/monitor **1** POWER switch to a power source.
2. Connect ECG cable to PaceMate simulator. Set PT Rate to 40.
3. Observe cardioscope. Select lead with tall QRS complex (positive or negative).
4. Push SYNC. Confirm SYNC message appears on status display. Adjust ECG SIZE until marker appears on upper portion of QRS complex. SYNC message blinks off with each detected QRS complex. Heart rate is displayed.
5. Push RECORD. Apply firm pressure with both standard paddles on TEST LOAD PLATES of Battery Support System. Confirm Test Load Select on Battery Support System is set at 50.
6. Select 50 joules with **2** ENERGY select dial.
7. Press **3** CHARGE.
8. Simultaneously push and **hold** both paddle discharge buttons until defibrillator discharges on next QRS complex.
9. Confirm the following: defibrillator returns to asynchronous mode (SYNC message no longer appears), recorder annotates time, date, @ 50J, and SYNC. Battery Support System displays 50 joules were delivered.

QUIK-PACE NONINVASIVE PACEMAKER

Equipment Needed

- LIFEPAK 10 defibrillator/monitor with optional pacemaker
- ECG cable
- Pacing cable
- PaceMate noninvasive pacing simulator

Testing Procedure

1. Turn defibrillator/monitor **1** POWER switch to a power source.
2. Attach ECG and pacing cables from the LIFEPAK 10 defibrillator/monitor with optional pacemaker to PaceMate simulator and turn simulator ON.
3. Push PACER. Pacing rate should display 40. Pacing current should display 0mA.
4. Observe cardioscope to confirm ECG signal from the PaceMate simulator is being displayed. Sense markers should appear on each QRS complex. If sense markers do not appear or appear elsewhere on the ECG, push ECG SIZE to adjust the signal.
5. Set PT Rate to 40 on PaceMate simulator.
6. Push RATE ▼ and ▲ to verify the selected rate changes on the display. Select a rate of 60 on the LIFEPAK 10 defibrillator/monitor.
7. Push START/STOP. Pacing energy will not be delivered as current is 0mA; however, adjacent START/STOP indicator light will flash off with each pacing spike. Pacing rate will display 60.
8. Push 20 ▼ and 20 ▲ to verify current display appropriately changes in 20mA increments.
9. Push ▼ 5 CURRENT 5 ▲ to verify 5mA increment changes.
10. Increase current to 125mA.
11. Observe cardioscope for captured complexes. Confirm light between pacing cable connectors on PaceMate simulator blinks with each delivered pacing pulse.
12. Remove pacing leads from the PaceMate simulator. The pacemaker will stop pacing, the message LEADS will appear on status display, and an audible alarm will sound.
13. Leave one pacing lead off and attempt to initiate pacing by pushing START/STOP. The message LEADS will appear on status display, and an audible alarm will sound.
14. Reattach both pacing leads.
15. Increase current to 125mA.
16. Press CHARGE. PACER indicator light should go off. Status display should indicate heart rate and joules.
17. Turn defibrillator power off to internally discharge energy.
18. Turn simulator power off.

Pacing Cable

Inspect and test the pacing cable as part of the noninvasive pacemaker test routine. Regular inspection and testing will help ensure noninvasive pacemaker and pacing cable are in good operating condition and are ready for use when needed.

If any discrepancy is detected, remove the noninvasive pacemaker and cable from active service and immediately notify a qualified service technician.

FAST-PATCH ADAPTER

Equipment Needed

- LIFEPAK 10 defibrillator/monitor
- FAST-PATCH defibrillation adapter
- Physio-Control QUIK TEST™ cable tester or Physio-Control Patient Simulator

  Caution: To prevent damage to testing devices, do not discharge more than 30 shocks per hour or 10 shocks per 5 minute period into tester/simulator.

Include inspection and testing of the defibrillation adapter as part of the defibrillator test routine. Daily inspection and testing help confirm defibrillator and defibrillation adapter are in good operating condition and are ready to use when needed.

If any discrepancy is detected during inspection or testing, remove the defibrillator and adapter from active service and immediately notify a qualified service technician.

Testing Procedure for FAST-PATCH Adapter Using QUIK TEST Cable Tester

1. Inspect snap connectors, defibrillation cable and connection to adapter for foreign matter, fraying, cracks, breaks or other signs of wear.
2. Align cable connectors over cable tester posts and press down to snap in place. Reversing cable connectors on posts will not affect test.
3. Turn defibrillator/monitor **1** POWER switch to a power source and select PADDLES. Select x1 ECG gain.
4. Select 360 joules with **2** ENERGY select dial.
5. Push **3** CHARGE.
6. Discharge the defibrillator by pushing both PADDLE discharge buttons simultaneously.
7. Confirm green indicator light flashes briefly.

   If green indicator light does not flash, remove defibrillator and adapter from active service and contact a qualified service technician.

8. To disconnect cable from cable tester, grasp cable connectors and pull straight out from post. Refer to Figure A.

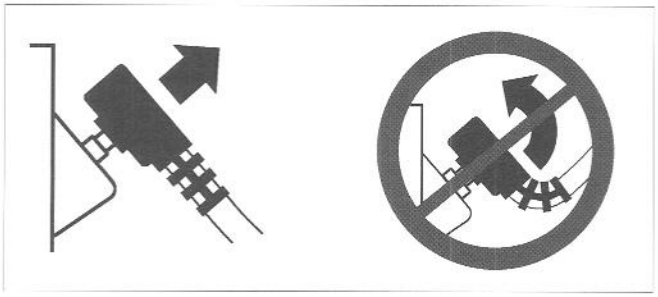


Figure A.

9. Hold the cable where it divides and shake cable. Confirm noisy signal appears on monitor screen.
10. Reconnect snap connectors to the QUIK TEST cable tester.
11. Check for a clean flat-line on monitor screen. Grasp cable where it divides and gently jiggle cable side to side continuously. Confirm signal remains clean. Refer to Figure B.

    If flat line is noisy or intermittent, remove defibrillator and adapter from active service and contact a qualified service technician.

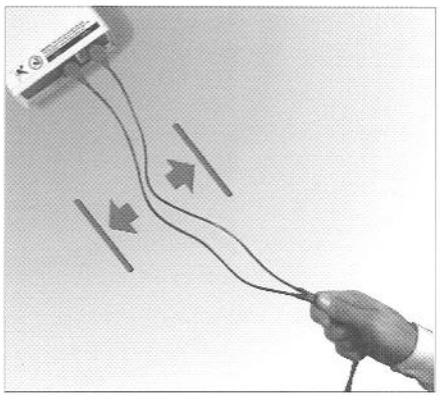


Figure B.

Testing Procedure for FAST-PATCH Adapter Using Patient Simulator

1. Inspect snap connectors, defibrillation cable and connection to adapter for foreign matter, fraying, cracks, breaks or other signs of wear.
2. Align cable connector labeled APEX over LEFT simulator test post and press down to snap in place.
3. Align cable connector labeled STERN over RIGHT simulator test post and press down to snap in place.

   The simulator operates if connectors are reversed; however, the ECG waveform is inverted.
4. Press the Patient Simulator ON. Confirm that LOW BATTERY indicator is not illuminated. Replace simulator batteries if needed.
5. Press VF to select ventricular fibrillation and confirm red indicator light illuminates on button.
6. Turn defibrillator/monitor **1** POWER switch to a power source. Select PADDLES lead.
7. Select 360 joules with **2** ENERGY select dial.
8. Push **3** CHARGE.
9. Discharge defibrillator.
10. Confirm yellow ACCEPTABLE DISCHARGE indicator flashes on Patient Simulator and the NSR red indicator light illuminates. Confirm rhythm on monitor screen is a normal sinus rhythm.

    If yellow indicator light does not flash or NSR light does not illuminate, remove defibrillator and defibrillation adapter from active service and contact a qualified service technician.
11. Check for a clean ECG signal on monitor screen.
12. Grasp cable where it divides and jiggle cable side to side. The signal should remain clean. Refer to Figure B.

    If ECG signal is noisy or intermittent, remove defibrillator and adapter from active service and contact a Physio-Control service representative.
13. To disconnect cable from simulator, grasp cable connectors and pull straight out from post. Refer to Figure A.

12 LEAD ECG ADAPTER

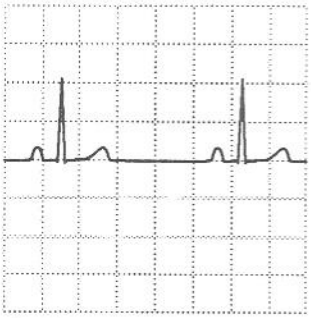
This test procedure requires a 12 lead ECG Patient Simulator (recommended: DynaTech Nevada 215A). The diagnostic frequency response mode must be enabled in the defibrillator set-up mode. This test procedure may vary according to the 12 lead simulator used.

Testing Procedure

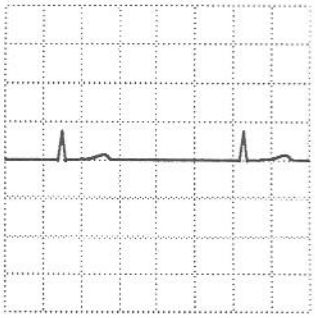
1. Inspect snap connectors, defibrillation cable and connection to adapter for foreign matter, fraying, cracks, breaks or other signs of wear.
2. Connect 12 Lead Adapter 6-pin cable to LIFEPAK 10 defibrillator/monitor ELECTRICALLY ISOLATED ECG connector.
3. Connect 10 lead cable snap connectors on the 12 Lead Adapter to appropriate connections on 12 lead Patient Simulator.
4. Select 60 bpm on the 12 lead Patient Simulator.
5. Turn defibrillator/monitor **1** POWER switch to a power source. Select Lead II.
6. Push and **hold** RECORD until device displays DIAG.

   If device does not display DIAG in status display window, refer to Service Manual or contact a qualified service technician to enable diagnostic frequency response for the recorder.
7. Set LIMB LEADS switch on 12 Lead Adapter to Lead I. V Leads switch position is not important in this step. Confirm defibrillator/monitor displays a heart rate of 60 ±4 bpm. Review recorder output and confirm recording is similar in shape and amplitude to Lead I position shown on page 38.
8. Repeat Step 7 for each of the other 11 switch settings. Compare printout to Figure C. Heart rate may not register in some low amplitude leads.

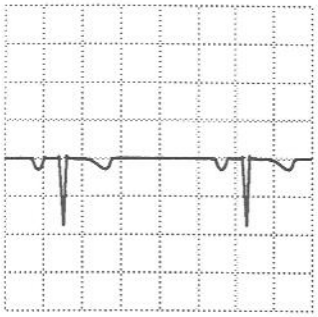
1. **Lead I**



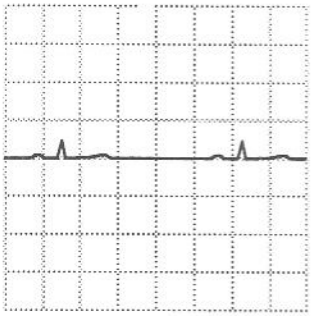
2. **Lead II**



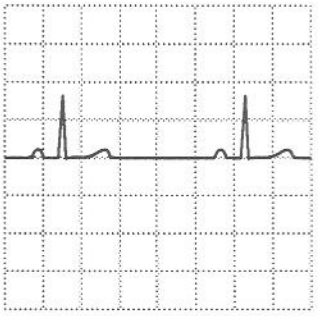
3. **Lead III**



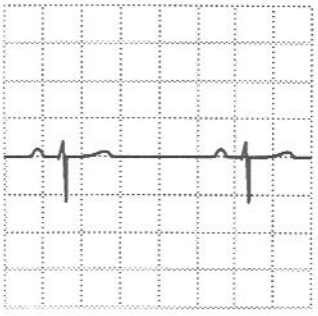
4. **AVR**



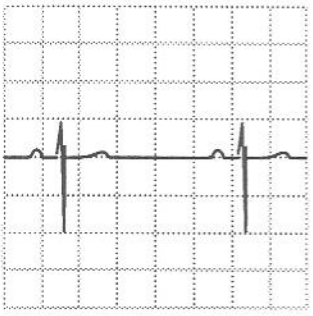
5. **AVL**



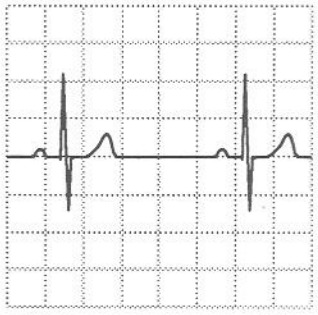
6. **AVF**



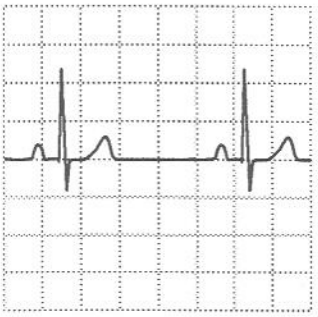
7. **V1**



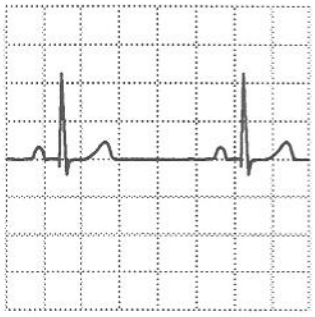
8. **V2**



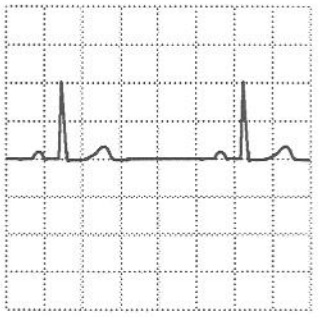
9. **V3**



10. **V4**



11. **V5**



12. **V6**

Figure C. 12 lead ECG from DynaTech Nevada 215A.

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SETTING THE CLOCK

1. To activate clock set-up mode, press and **hold** RECORD on APEX paddle and turn defibrillator/monitor **1** POWER switch to a power source. Numbers in heart rate section of status display flash. These numbers represent the hour digits of the 24 hour clock. *The hours display always reads "00" when clock set-up mode is activated.*
2. Press QRS VOL until desired hour is displayed.
3. Pressing the ▲ on ECG SIZE scrolls through the remaining clock settings in the heart rate display (each flashes) in the following order:

- Minutes (0-59)
- Month (1-12)
- Day (1-31)
- Year (0-99; the year 2000 shows as 00, 2001 as 01, etc.)

4. Press the ▲ on the QRS VOL to change any of the clock settings.
5. To terminate clock set mode turn **1** POWER switch to OFF.
6. Confirm proper clock setting by turning on LIFEPAK 10 defibrillator/monitor and pressing RECORD after self-test is complete. The printed strip should include proper time/date annotation.

CLEANING

Clean the LIFEPAK 10 defibrillator/monitor case, paddles, cables, FAST-PATCH adapter, 12 Lead ECG Adapter, and DC and AC auxiliary power modules with mild soap and water using a damp sponge or soft cloth.

Do not clean with alcohol, ketones or other flammable agents.

The recorder parts should be cleaned with a damp, soft cloth. Do not use abrasive agents.

Posterior and pediatric paddles may be gas sterilized. Gas sterilization of paddles must be in accordance with procedures accepted by the Joint Commission on Accreditation of Healthcare Organizations and as recommended by the gas sterilization equipment manufacturer.

This brief table is intended for nontechnical personnel. If trouble persists after consulting this guide, call a qualified service technician.

MONITOR

Observation	Recommended Action/Possible Cause
1. Device does not function when **1** POWER switch is turned to a power source. No trace on cardioscope.	1.1 Confirm batteries are fully charged and secured in battery wells. 1.2 Check battery pins in selected battery well for signs of damage. (Power may be intermittent in some cases.) 1.3 If using AUX power module confirm it is connected to line power and to defibrillator/monitor.
2. Interference on cardioscope when using ECG cable.	2.1 Check ECG cable connection to electrodes and patient. 2.2 Check for damaged ECG cable. 2.3 Check patient skin preparation, electrode contact, electrode placement or electrode expiration date. 2.4 Check for presence of a strong radio frequency electrical field (such as diathermy, radio signals, etc.). If possible, turn off or move noise generating equipment. 2.5 Check PADDLES lead selected. Select Lead I, II, or III when using ECG cable. 2.6 If excessive line (50 or 60Hz) frequency interference is suspected in DIAG, select notch frequency and enable the built-in notch filter via set-up menu. Contact a qualified service representative for assistance.
3. Excessive interference (noise) on cardioscope when using PADDLES mode ECG monitoring.	3.1 Check for paddle electrode surface dirt. 3.2 Check PADDLES lead is selected. 3.3 If using FAST-PATCH disposable defibrillation/ ECG electrodes, check for proper skin preparation, electrode contact, electrode placement, defibrillation adapter function, or expired electrodes. 3.4 Check that material used between paddles and skin is appropriate for defibrillation.
4. Poor ECG signal on cardioscope when using ECG cable. However, CAL does provide a 1mV pulse on cardioscope.	4.1 Check proper lead is selected. 4.2 Check electrodes are positioned correctly. 4.3 Replace incorrect/failed ECG cable.
5. Straight line only on cardioscope and recorder when signal is applied or CAL is pushed.	5.1 Increase ECG SIZE.

Observation	Recommended Action/Possible Cause
6. No ECG signal on cardioscope when using ECG cable.	6.1 Check LEAD SELECT is set to I, II, or III (not PADDLES). 6.2 Check ECG cable. 6.3 Check ECG electrodes are not positioned too close together.
7. No ECG signal on monitor screen with paddle monitoring (QUIK-LOOK with standard paddles or FAST-PATCH electrode monitoring).	7.1 Check PADDLES lead is selected. 7.2 Check defibrillation adapter and standard paddles are properly inserted. 7.3 Inspect defibrillation adapter, paddles and/or cables for damage. 7.4 Discharge defibrillator into Battery Support System test load to test for cable integrity.
8. Recorder does not advance paper.	8.1 Battery discharged below operating level. Replace with fully charged battery. 8.2 Out of paper. Add new paper roll. 8.3 Operating recorder outside of specified operating temperature range. Allow device to cool down or warm up. 8.4 Paper not loaded correctly.
9. ECG recording appears wrinkled.	9.1 Check paper. ECG paper loaded improperly.
10. ECG recording appears smudged.	10.1 Check correct ECG paper is in use. Use only paper designed for thermal array recorders.
11. No systole sound.	11.1 Increase QRS VOL (powers up at zero volume). 11.2 Increase ECG SIZE. Gain may be too low for proper QRS detection. 11.3 ECG amplitude too low in that lead. Select another lead or alter electrode position.
12. No SYNC marker on cardioscope.	12.1 Check SYNC selected. 12.2 Increase ECG SIZE. Gain may be too low for proper QRS detection. 12.3 ECG amplitude too low in that lead. Select another lead or alter electrode position. 12.4 Reprep skin and apply new electrodes.
13. SYNC indicator does not blink when sync mode is selected.	13.1 Increase ECG SIZE. Gain may be too low for proper QRS detection. 13.2 ECG amplitude too low in that lead. Select another lead or alter electrode position.
4. SYNC marker not positioned within QRS complex.	14.1 Adjust ECG SIZE until QRS indicator is properly positioned. 14.2 Amplitude of ECG signal too low in that lead. Select another lead or move electrodes.

Observation	Recommended Action/Possible Cause
15. Heart rate is not displayed.	15.1 Increase ECG SIZE. Gain may be too low for proper QRS detection. 15.2 ECG amplitude too low in that lead. Select another lead or alter electrode position. 15.3 Noninvasive pacing in progress (heart rate display replaced by pacing rate). 15.4 Patient's heart rate less than 20 bpm. 15.5 Reprep skin and apply new electrodes.
16. LOW BATTERY indicator remains flashing despite attempts to charge battery. However, device operates normally using auxiliary power module.	16.1 Replace battery. 16.2 Use auxiliary power module.
17. Device shuts down with brief or no LOW BATTERY indicator.	17.1 Battery is damaged, improperly maintained or depleted. (Occurs if battery is very low on charge and defibrillation is attempted.) 17.2 Switch to fully charged battery or auxiliary power module.
18. Time or date on recorder incorrect (or 00ERR00 annotated).	18.1 Reset clock. Refer to page 39.
19. Service Indicator appears continuously on status display.	19.1 Service indicator will appear during clock set. 19.2 Unit requires service by qualified service technician.
DEFIBRILLATOR	
20. Charge time to 360 joules exceeds 12 seconds.	20.1 Replace battery. 20.2 Use auxiliary power module. 20.3 Allow device to warm to 10°C (50°F).
21. Energy is not delivered to patient when both paddle discharge buttons are pressed (using standard paddles or FAST-PATCH defibrillation electrodes).	21.1 Device is in SYNC mode and no QRS complexes are detected. 21.2 Wait for charge done tone; defibrillator has not reached selected energy level. 21.3 More than 60 seconds have elapsed since charge done tone. Energy has been internally dumped. 21.4 Energy has been internally dumped because the ENERGY select dial was changed after charge was complete. 21.5 Check defibrillation adapter and standard paddles are properly inserted if using the defibrillation adapter. 21.6 If using the defibrillation adapter, check FAST-PATCH electrodes are properly connected. 21.7 Check defibrillation cable is functioning properly when using the defibrillation adapter. 21.8 Discharge defibrillator into Battery Support System test load to test for paddle cable integrity.

Observation	Recommended Action/Possible Cause
22. AVAILABLE ENERGY does not match energy selected when defibrillator is fully charged.	22.1 Defibrillator is out of calibration. Contact a qualified service technician.
23. Numbers do not appear or scroll very slowly in AVAILABLE ENERGY window in status display when CHARGE pushed.	23.1 Replace battery. 23.2 Connect device to auxiliary power module if available.
24. AVAILABLE ENERGY flashes and scrolls to zero after defibrillator discharge.	24.1 Paddles discharged into open air. 24.2 Check proper paddle pressure and contact is maintained. 24.3 Possible failure in defibrillator discharge pathway (connectors, cables, etc.).
25. Patient didn't "jump" (no muscle response during defibrillator discharge.)	Patient muscle response is variable. If no muscle response is observed and accurate defibrillator energy output is confirmed, possible factors include: 25.1 Prolonged cardiac arrest. 25.2 Insufficient or inappropriate gel, inadequate paddle pressure, other physiological factors.
PACEMAKER	
26. Device does not function when PACER is pushed.	26.1 Check battery is fully charged. 26.2 Use auxiliary power module if available.
27. PACER light on, but START/STOP light does not illuminate when pressed.	27.1 Pacing lead off. LEADS message displayed. Inspect pacing cable and/or pacing electrode connections. 27.2 PADDLES selected.
28. Pacing stops spontaneously.	28.1 PACER power off. Turn on PACER. 28.2 Detection of an internal failure has occurred. The pacemaker is inoperative and requires service by a qualified service technician. 28.3 Pacing lead off. LEADS message displayed. Check pacing cable and pacing electrode connections. 28.4 PADDLES lead selected. Select Lead I, II, or III and reinitiate pacing. 28.5 CHARGE has been pushed. 28.6 Use of radio equipment while pacing may cause current delivery to stop and the service message (⚠) will appear accompanied by tones. Push PACER which turns PACER off and will discontinue service message and tones. To reinitiate pacing, follow steps as outlined in Pacing Procedure, page 25. To minimize radio interference, move radio farther away from defibrillator/monitor. If unable to move radio away, reorient the radio.

Observation	Recommended Action/Possible Cause
28. Pacing stops spontaneously. (continued)	28.7 Battery may be depleted. Replace with fully charged battery or use Auxiliary Power Module if available.
29. No ECG trace on monitor.	29.1 Check ECG leads are connected and Lead I, II, or III is selected (not PADDLES lead). Check ECG cable and patient/electrode connections. 29.2 Check proper power source is selected.
30. Cardioscope displays interference while pacing.	30.1 ECG electrodes not optimally placed with respect to pacing electrodes. 30.2 ECG signal may be difficult to interpret at higher pacing rates. 30.3 Select another Lead (I, II, or III). 30.4 Patient response to pacing is highly variable with respect to capture threshold and ECG distortion. Consider altering pacing rate. Consider moving ECG electrodes away from pacing electrodes to optimize patient response and ECG signal integrity.
31. Capture does not occur with pacing stimulus.	31.1 Increase current level. (Administer sedation/analgesia as needed.) 31.2 Assess pacing electrode placement and pacing cable polarity (color code). 31.3 Consider invasive pacing. Patient response to pacing therapy (noninvasive and invasive) is dependent upon many factors. 31.4 Confirm pacemaker is delivering energy with PaceMate simulator.
32. LEADS message appears.	32.1 Check for proper use of ECG cable during pacing. Select Leads I, II, or III. 32.2 Inspect pacing cable and/or pacing electrode connections.
33. Intrinsic QRS complexes not sensed when pacing.	33.1 Adjust ECG SIZE until sense marker is properly positioned. 33.2 Amplitude of ECG signal too low in that lead. Select another Lead (I, II, or III) or move ECG electrodes. 33.3 Intrinsic QRS complexes occurring during pacemaker's refractory period.

ECG MONITOR

ECG LEAD SELECTION	Paddles, I, II, III
INPUT	Isolated ECG via QUIK-LOOK defibrillation paddles, FAST-PATCH electrodes, or 3 lead ECG cable
ELECTRICAL ISOLATION AND SHIELDING	Input protected against high voltage defibrillator pulses and radio frequency interference per FDA Standard MDS-201-0004. RF interference depends on distance from RF source, radio output power, radiating efficiency, vehicle environment, etc.
ECG CABLE LENGTH	3.96m (13 ft) total length; 3.05m cable (10 ft) with .91m leads (3 ft)
COMMON MODE REJECTION	Minimum 100dB with respect to chassis ground at 60Hz, 65dB minimum with respect to isolated ground

CARDIOSCOPE DISPLAY

Size:	72.5mm (2.85 in) x 43.5mm (1.7 in), non-fade
Sweep speed:	25mm/sec
Frequency response:	
monitor freq. resp. (domestic)	1 to 30Hz, -3dB
monitor freq. resp. (agency)	0.5 to 25Hz, -1.4dB
expanded freq. resp. while recorder in DIAG mode	.05 to 30Hz, -3dB
paddles freq. resp.	2 to 20Hz, -dB

STRIP CHART RECORDER

Paper size:	50mm x 30m (100 ft)
Paper speed:	25mm/sec
Frequency response:	
monitor freq. resp. (domestic)	1 to 30Hz, -3dB
monitor freq. resp. (agency)	.5 (-1.4dB) to 40 (-3dB) Hz,
diagnostic freq. resp.	.05 to 100Hz, -3dB
paddles freq. resp.	2 to 20Hz, -3dB
CODE SUMMARY	
domestic	1 to 30Hz
agency	.5 to 40Hz
Annotation:	Includes time, date, lead, gain, heart rate, defibrillation and/or pacing parameters
CODE SUMMARY critical event record:	Digitally stored record of critical ECG and device parameters

STATUS DISPLAY	
HEART RATE (bpm):	3 digit readout displays rates from 20 to 295 bpm
AVAILABLE ENERGY:	0 - 360 joules
Pacing rate (optional):	40 - 170 bpm
Pacing current (optional):	0 - 200mA
DIAG:	Indicates recorder frequency response is .05 to 100Hz, -3dB

MONITOR CONTROLS	
ECG SIZE:	Adjusts ECG gain
QRS VOL:	Adjusts loudness of QRS beeper
FREEZE:	Momentarily halts the ECG trace on CRT
CODE SUMMARY:	Activates CODE SUMMARY printout
RECORD:	Activates strip chart recorder; activates diagnostic mode if held for more than 1 second (when enabled)
CAL:	Sends calibration pulse to monitor input
SYNC:	Triggers energy delivery to patient's QRS complex
LEAD SELECT:	Selects ECG Input: Paddles, I, II, III

ECG OUTPUT	
Unmodulated:	1V/mv at x1 gain
Modulated:	1400Hz ± 2% center frequency, 1V rms ±10%
Frequency response:	Matches strip chart recorder

DEFIBRILLATOR

WAVEFORM	5msec monophasic pulse (Edmark) per AAMI spec
ENERGY SELECT	0, 5, 10, 20, 50, 100, 200, 300, 360 joules
CHARGE TIME	360 joules in less than 12 seconds above 0°C (32°F)
PADDLE AREA	82cm² (adult) 16cm² (pediatric)
CORD LENGTH	2.3m (7.5 ft)
SYNCHRONIZER	Energy discharge within 20msec of sync marker on cardioscope (triggers to patient generated QRS complex)

PADDLE CONTROLS	CHARGE (with indicator light) RECORD (activates strip chart recorder) ENERGY select dial (rotating dial; 0 to 360 joules) ⚠ (dual energy discharge buttons, one on each paddle)

QUIK-PACE NONINVASIVE PACEMAKER

OUTPUT RATE	40 to 170 bpm
RATE ACCURACY	±1.5% over entire range
OUTPUT WAVEFORM	Monophasic, truncated, exponential current pulse 20 ±1msec duration measured at output current ≥10mA peak.
OUTPUT CURRENT	0 to 200mA ±5% or 5mA (whichever is greater) at 700 ohms. Output variation less than 5% over the load range of 100 to 1500 ohms

REFRACTORY PERIOD

Pacing rates	***Refractory period***
40-90	340msec ± 3%
100	300msec ± 3%
110-120	250msec ± 3%
130-140	220msec ± 3%
150-170	200msec ± 3%

ENVIRONMENTAL

Temperature	
Standby:	5 to 55°C (41 to 131°F)
Operating:	-10 to 55°C (14 to 131°F) after minimum 2 hour storage at standby temperature
Storage (exclusive of batteries):	-30 to 65°C (-22 to 149°F)
HUMIDITY	0 to 95% (non-condensing) 0 to 34°C (32 to 93.2°F) 0 to 80% (non-condensing) 35 to 55°C (95 to 131°F)
ATMOSPHERIC PRESSURE	797 to 439mmHg (-570 +15,000 ft)

VIBRATION	
Helicopter Aircraft:	MIL-STD-810D, method 514.3 (category 6). Test levels per US Army Aeromedical Research Laboratory Report no. 91-14, section 2.6.3 (March 1991), (UH-1 helicopter, floor under co-pilot's seat).
Fixed-Wing, Turboprop Transport: (take off and climb)	Test level of .0016 g^2/Hz, the maximum level per figure 32(31) of ECRI Report, contract no. 223-77-5035. Prepared for FDA (April 1979).
Caution: To help prevent component damage, the device should not be mounted near vibration sources such as engine struts and landing gear.	
SHOCK (DROP)	With carrying case (soft case), passes drops of 43 inches from the handle (30 inches from case). This exceeds test levels per ECRI report, contract no. 223-77-5035, prepared for FDA (April 1979).
SEALED CASE	MIL- STD-108E and IEC 601-2-4

General

BATTERY	3 NiCad batteries, 12 V, 1.0 amp hours each. A new battery registering at least 100% capacity on the Battery Support System will provide at a minimum: • 45 minutes of monitoring, or • 30 minutes of pacing, or • 25 discharges at 360 joules per battery.
HEIGHT	10.4cm (4 in)
WIDTH	40.6cm (16 in)
DEPTH	37cm (14.6 in)
WEIGHT	9kg (20 lbs)

All specifications at 25°C unless otherwise stated.

WARRANTY POLICY (USA ONLY)

The LIFEPAK 10 monitor/defibrillator with pacemaker option is warranted against all defects in materials and workmanship for a period of one year from the date of delivery.

All batteries supplied by Physio-Control for LIFEPAK defibrillator/monitor products are warranted for a period of one year. If Physio-Control receives notice of a battery defect during the warranty period, it will replace the battery upon verification of defect by Physio-Control.

All product accessories are warranted against all defects in parts and workmanship for a period of 90 days from the date of delivery.

Use of non-Physio-Control defibrillation and pacing electrodes, batteries, battery chargers, accessories, or adapter devices may void Safety Agency Certifications and warranty.

Refer to the warranty statement included in the accessory kit which is shipped with the product. Duplicate copies may be obtained in the USA by calling the Physio-Control PARTSLINE™ at 1-800-442-1142. Outside the USA, contact the local Physio-Control sales or service office.

SERVICE

If the LIFEPAK 10 defibrillator/monitor requires service, contact a Physio-Control service representative or a qualified service technician. When calling Physio-Control to request service, please identify model and serial number and describe observation. If the device must be shipped to the service center or factory, special packing is necessary to prevent shipping damage.

Circuit diagrams, component parts lists, calibration instructions, and other relevant technical information are found in the LIFEPAK 10 defibrillator/monitor Service Manual.

In the USA, call Technical Services at 1-800-442-1142 for technical consultation, manuals, or parts (PARTSLINE). Outside the USA, contact the local Physio-Control sales or service office.

The following guideline outlines functional and electrical safety testing of the defibrillator/monitor at periodic intervals. It complements the internal quality assurance programs of the hospital, clinic, or emergency medical service.

Testing should be preceded by a thorough visual inspection of the defibrillator/monitor. Examine the device and accessories for cracks in the case and cables, pitted paddle plates, presence of gel on paddles or paddle storage wells, and for the proper function of controls. Corrective action should be taken immediately.

While examining the device, the operator should check that all accessories are present and functional.

Routine testing of defibrillator/monitors operating from battery power will consume battery power. The operator should make sure batteries are promptly recharged according to instructions in Nickel-Cadmium Battery Maintenance, page 28.

Physio-Control recommends the following minimum program of routine maintenance and testing for clinical personnel. Additional preventive maintenance and testing such as electrical safety tests, performance inspection, and calibration should be performed routinely by biomedical personnel. Contact a qualified service technician immediately if device or accessory discrepancies are noted.

A separate checklist entitled "Manual Defibrillators: Operators Shift Checklist" is included with shipment of your LIFEPAK 10 defibrillator/monitor.

Caution: While the LIFEPAK 10 defibrillator/monitor is designed specifically for transport environments, it may be damaged by mechanical/physical abuse (e.g. immersion in water, drop exceeding 30 inches with carrying case, drop exceeding 18 inches without carrying case). Contact a Physio-Control service representative if abuse occurs.

RECOMMENDED MAINTENANCE AND TESTING FOR CLINICAL PERSONNEL

	Daily	After Use	As Required	Weekly	Quarterly	Every Six Months
Clean defibrillator/monitor		•	•		•	
Check that all necessary supplies and accessories are present and in operating condition (e.g. gel, batteries, ECG paper, ECG cable, electrodes, etc.)	•	•	•			
Check/change recorder paper			•			
Operational tests:						
Monitor function	•		•			
Defibrillator/SYNC discharge	•		•			
Pacemaker function	•		•			
Standard Paddles	•		•			
FAST-PATCH Adapter	•		•			
Inspect case, cables, connectors, and accessories, for function			•	•		
Confirm that paddles are clean	•	•	•			
Perform Battery Reconditioning Procedure			•		•	
Perform Battery Shelf Life Test			•			•

Contact Physio-Control for complete part number.

DEVICES

804200-28 . . . . . LIFEPAK 10 defibrillator/monitor with QUIK-PACE noninvasive pacemaker
804200-33 . . . . . LIFEPAK 10 defibrillator/monitor without QUIK-PACE noninvasive pacemaker
801807 . . . . . Battery Support System

POWER SUPPLIES AND ADAPTERS

9-10424-09 . . . . . LIFEPAK 10 defibrillator/monitor FASTPAK battery
804217 . . . . . AC auxiliary power module
804220 . . . . . DC auxiliary power module
805094 . . . . . LIFEPAK 10 defibrillator/monitor FAST-PATCH adapter
805600 . . . . . 12 Lead ECG Adapter

PADDLES AND ELECTRODES

804545-001 . . . . . FAST-PATCH disposable defibrillation/ECG electrodes (1 set)
804545-010 . . . . . FAST-PATCH disposable defibrillation/ECG electrodes (10 sets)
804545-050 . . . . . FAST-PATCH disposable defibrillation/ECG electrodes (50 sets)
803377-101 . . . . . QUIK-PACE disposable noninvasive pacing electrodes (1 set)
803377-501 . . . . . QUIK-PACE disposable noninvasive pacing electrodes (5 sets)
803377-251 . . . . . QUIK-PACE disposable noninvasive pacing electrodes (25 sets)
800139-030 . . . . . LIFE•PATCH ECG electrodes (10 packets, 3 electrodes per packet)
800418 . . . . . Pediatric paddle, external (2 required)
802461 . . . . . Posterior paddle

CABLES

805400 . . . . . 90 degree angled ECG cable, 3 lead (AHA)
800947 . . . . . ECG cable, 3 lead (IEC)
802905 . . . . . Pacing cable

BATTERY MAINTENANCE FORMS

806017 . . . . . Battery Reconditioning Procedure (pad of 25 sheets)
806018 . . . . . Battery Shelf Life Test (pad of 25 sheets)
806019 . . . . . Battery Maintenance Log (pad of 50 logs)

TESTERS AND SIMULATORS

805550 . . . . . QUIK TEST cable tester
803499 . . . . . Physio-Control Patient Simulator
804820 . . . . . PaceMate Noninvasive Pacing Simulator

MISCELLANEOUS

805155 . . . . . LIFEPAK 10 defibrillator/monitor carrying case (soft case)
804700-003 . . . . . Recorder paper (1 box, 3 rolls per box)
804700-150 . . . . . Recorder paper (50 boxes, 3 rolls per box)
9-10236-012 . . . . . DERMA JEL® electrode gel (box of 12 4-oz. tubes)
802562 . . . . . Wall mounting rack for the Battery Support System

OPERATING INSTRUCTIONS

805057 . . . . . LIFEPAK 10 defibrillator/monitor with optional pacemaker
802371 . . . . . Battery Support System
805364-01 . . . . . Physio-Control DC auxiliary power module
805364-00 . . . . . Physio-Control AC auxiliary power module
805693 . . . . . 12 Lead ECG Adapter
805031 . . . . . FAST-PATCH adapter
805077 . . . . . FAST-PATCH disposable defibrillation/ECG electrodes
803377 . . . . . QUIK-PACE disposable noninvasive pacing electrodes

OTHER LITERATURE AND VIDEOS

805074 . . . . . Booklet: "Noninvasive Pacing: What You Should Know"
805662 . . . . . Booklet: "Defibrillation: What You Should Know"
805339 . . . . . Slides: "Noninvasive Pacing: What You Should Know"
804271 . . . . . LIFEPAK 10 defibrillator/monitor Service Manual
805156-00 . . . . . LIFEPAK 10 defibrillator/monitor inservice video (NTSC)
805156-01 . . . . . LIFEPAK 10 defibrillator/monitor inservice video (PAL)
806008-00 . . . . . Inservice video "Care and Maintenance of the NiCad Battery and the Battery Support System" (NTSC)

ITEMS SHIPPED WITH THE LIFEPAK 10 DEFIBRILLATOR/MONITOR

2 Operating Instructions
Service Manual
3 FASTPAK batteries
DERMA JEL electrode gel
90 degree angled ECG cable, 3 lead
3 rolls ECG paper
ECG ruler
Programming key (for use by qualified service technician)
3 LIFE•PATCH ECG electrodes
Booklet: "Defibrillation: What You Should Know"
If QUIK-PACE pacemaker option selected:
Pacing cable
QUIK-PACE disposable noninvasive pacing electrodes
Booklet: "Noninvasive Pacing: What You Should Know"

Consult your Physio-Control representative regarding other available replacement items and accessories.

WARNING REFERENCE GUIDE

All of the warnings provided in the previous sections of this manual are reproduced for reference in this appendix.

General Warnings

- **Possible loss of power during patient care.** Proper care and maintenance of batteries is vital to the performance of the LIFEPAK 10 defibrillator/monitor. Always carry a spare, *fully charged, properly maintained* battery.
- **Shock hazard.** When discharged, this defibrillator delivers up to 360 joules of electrical energy. Unless discharged properly as described in these Operating Instructions, this electrical energy may cause personal injury or death. Do not attempt to operate this device unless you are thoroughly familiar with these Operating Instructions and the function of all controls and indicators, as well as the connections and accessories.
- **Shock or fire hazard.** Do not immerse any portion of this device in water or other fluids. Avoid spilling any fluids on device or accessories. Do not clean with alcohol, ketones, or other flammable agents. Do not autoclave this device or accessories.
- **Possible fire or explosion.** Use care when operating this device close to oxygen sources (such as bag-valve-mask devices or ventilator tubing) and flammable gases and anesthetics.
- **Safety risk.** Use of non-Physio-Control defibrillation and pacing electrodes, batteries, battery chargers, accessories, or adapter devices may cause the device to operate improperly.
- **Possible interference with implanted devices.** Magnets inside the standard defibrillation paddles may affect the function of an implanted pacemaker or implanted defibrillator if paddles are positioned over or near implanted devices. Have function of implanted device checked after using standard paddles.
- **Safety risk and possible equipment damage.** Defibrillators, monitors, pacemakers, and their accessories (including electrodes and cables) contain ferromagnetic materials. As with all ferromagnetic equipment, these products must not be used in the presence of the high magnetic field created by a Magnetic Resonance Imaging (MRI) device. The high magnetic field created by an MRI device will attract the equipment with a force sufficient to cause death or serious personal injury to persons between the equipment and the MRI device. This magnetic attraction may also damage the equipment. Consult with the MRI manufacturer for more information.

Monitoring Warnings

- **Safety risk.** Use only Physio-Control ECG cables listed in this manual. Substitution of non-Physio-Control ECG cables may result in inaccurate ECG data.
- **Possible misinterpretation of cardioscope ECG data.** The cardioscope frequency response is only intended for rhythm identification. Use the recorder in DIAG mode for diagnostic interpretations.
- **Possible misinterpretation of ECG recordings.** When attempting to visually detect subtle ECG characteristics such as ST segment abnormalities, use only the recorder in diagnostic frequency response mode (DIAG). The monitor frequency response mode does not provide the resolution required for diagnostic and ST segment interpretation, and is intended only for basic ECG rhythm identification.
- **Possible electrical interference with ECG monitoring.** Do not operate this device in conjunction with electrocautery or diathermy equipment. Such equipment, as well as equipment which emits strong radio frequency signals, can cause electrical interference and distort the ECG signal displayed by the monitor, thereby preventing accurate rhythm analysis.

Defibrillation Warnings

- **Shock hazard.** When discharged, this defibrillator delivers up to 360 joules of electrical energy. Do not touch the metal paddle plates or defibrillation electrodes.
- **Shock hazard.** If a person is touching the patient, bed, or any conductive material in contact with the patient during defibrillation, the delivered energy may be partially discharged through that person. Make sure everyone stands away from the patient, bed, and other conductive material before discharging the defibrillator.
- **Possible burns and ineffective energy delivery.** Do not allow physical contact between the ECG or pacing electrodes and the paddles, defibrillation electrodes, or defibrillation gel. Such contact can cause electrical arcing and patient skin burns during defibrillation and may divert defibrillating energy away from the heart muscle.
- **Shock hazard.** Conductive gel (wet or dry) on the paddle handles can allow the electrical energy to discharge through the operator during defibrillation. Be sure to completely clean the paddle plates, handles, and storage wells after defibrillation.

- **Possible skin burns**. During defibrillation, air pockets between the skin and paddle plates or defibrillation electrodes can cause patient skin burns. To help prevent air pockets, completely cover paddle plates with conductive gel and press paddles firmly against the patient, or make sure self-adhesive defibrillation electrodes completely adhere to the skin. The conductive gel or electrodes must not be dried out.
- **Possible interference with implanted pacemakers**. When cardioversion or defibrillation is performed in patients with permanent pacemakers, care should be taken to avoid placing the paddles/defibrillation electrodes near the pacemaker's generator since defibrillation can cause pacemaker malfunction. Check pacing thresholds for implanted pacemaker patients.
- **Possible interference with implanted devices**. Check function of implanted devices after defibrillation or synchronized cardioversion.
- **Possible burns and ineffective energy delivery**. A gel pathway on the skin between the paddles will cause the current to arc between paddles and divert defibrillating energy away from the heart muscle. Do not allow conductive gel to become continuous between paddle sites.
- **Possible paddle damage and skin burns**. Do not discharge the defibrillator with the paddle plates shorted together because this may pit or damage the paddle plate surface. Pitted or damaged paddle plates can cause patient skin burns during defibrillation.
- **Shock hazard**. Do not discharge the defibrillator into the open air or into paddle wells. To internally dump an unneeded electrical charge, rotate the ENERGY select dial on the STERNUM paddle or turn the defibrillator POWER switch to OFF.

Synchronized Cardioversion Warning

- **Possible improper synchronization**. Monitoring the ECG through the standard paddles (QUIK-LOOK monitoring) could introduce artifact and lead to improper synchronization during cardioversion. Always use the patient cable and ECG electrodes or the FAST-PATCH system to monitor ECG during synchronized cardioversion.

FAST-PATCH Adapter/Disposable Electrode Warnings

- **Possible burns and ineffective energy delivery**. Use of disposable defibrillation electrodes which are dried out or damaged may cause electrical arcing and patient skin burns during defibrillation. To help prevent drying, do not use electrodes if:
  - -beyond expiration date
  - -package is unsealed
  - -package has been opened longer than 24 hours
  - -protective liner has been removed from electrodes for more than 30 minutes

  To help prevent damage:
  - -do not crush electrodes under heavy objects
  - -do not autoclave, gas sterilize, immerse in fluids, or clean electrodes with alcohol or solvents.

  Inspect electrodes to make sure the gel is not torn, split, or separated from metal backing. Do not use conductive gel, paste, or gel pads with disposable defibrillation electrodes.
- **Possible cable damage and ineffective defibrillation energy delivery or loss of monitoring**. Stretching or improper disconnection of the defibrillation cable can cause cable damage which may not be visible. To help prevent cable damage, follow the connection and disconnection procedures, page 19. Do not jerk the cable strain relief when removing the snap connector from the electrode posts. Position the defibrillation cable so it will not be pulled, snagged, or tripped over during use.
- **Possible shock, burns and ineffective energy delivery**. Do not substitute ECG electrodes or pacing electrodes for disposable defibrillation electrodes.
- **Possible electrode damage and patient skin burns**. Do not try to reposition the defibrillation electrodes after they have been applied to the patient. This may damage the adhesive and cause patient skin burns during defibrillation. If the position must be changed, remove and discard electrodes and replace with new ones.
- **Possible fire, burns and ineffective energy delivery**. Do not place standard paddles, gel, paste, or defibrillation gel pads in contact with disposable defibrillation electrodes.

Noninvasive Pacing Warnings

- **Possible interruption of therapy**. Do not leave patient unattended while pacemaker is in use. Observe the patient continuously to assess any changes in patient response to pacing therapy.
- **Possible skin burns and ineffective pacing therapy**. Use of pacing electrodes which are dried out or damaged may cause electrical arcing and patient skin burns during pacing. To help prevent drying or damage, do not use pacing electrodes if they have been removed from the foil package for more then 24 hours or if the protective liner has been removed for more than 60 minutes. Do not use electrodes beyond expiration date. Inspect electrodes to make sure adhesive is intact and undamaged.
- **Possible inhibition of pacing therapy**. Do not substitute ECG electrodes or defibrillation electrodes for pacing electrodes.

- **Possible patient skin burns during prolonged pacing**. Prolonged noninvasive pacing may cause patient skin irritation and burns, especially with higher pacing current levels. Discontinue noninvasive pacing if skin becomes irritated and another method of pacing is available.
- **Possible improper pacing**. The ECG size must be properly adjusted in order to detect intrinsic complexes and deliver pacing pulses when appropriate. If ECG size is set too high or too low, pacing pulses may not be delivered when required.
- **Possible interruption of therapy**. If PADDLES lead is selected during pacing, the pacing current output is reduced to 0mA and pacing therapy stops.
- **Possible interruption of therapy**. Use of radio transmitters while pacing may cause pacing therapy to stop. To minimize radio interference, move radio farther away from defibrillator/monitor. If unable to move radio away, reorient the radio.

12 Lead ECG Adapter Warnings

- **Possible inaccurate 12 lead ECG recordings**. If the diagnostic frequency response mode (DIAG) is not enabled, recorded 12 lead ECG data will be inaccurate.
- **Possible inaccurate 12 lead ECG information**. Use the 12 Lead ECG Adapter only with the LIFEPAK 10 defibrillator/monitor.

Battery Warnings

- **Possible loss of power during patient care**. Using an improperly maintained battery to power the defibrillator/monitor may cause premature power loss. Use the Battery Support System to properly maintain batteries.
- **Possible loss of power during patient care**. Stored batteries lose charge. Failure to charge a stored battery before use may cause premature defibrillator/monitor power loss. Always charge a stored battery before returning it to active service.
- **Possible loss of power during patient care**. Physio-Control has no information regarding the performance or effectiveness of its LIFEPAK defibrillator/monitors if they are used with non-Physio-Control batteries or battery chargers. Using non-Physio-Control batteries or battery chargers may result in device failure and may void warranty. Use only Physio-Control batteries and the Battery Support System.
- **Fire or explosion hazard**. The battery charger which accepts only two batteries (two-well Battery Charger, P/N 9-00284, 9-00288, or 801530) is not designed to charge FASTPAK batteries. Charging FASTPAK batteries in the two-well Battery Charger may reduce battery life and create a fire or explosion risk. Use only the Battery Support System to charge FASTPAK batteries.
- **Possible loss of power during patient care**. The two-well Battery Charger does not perform all the tests required to properly evaluate battery performance. Using an improperly maintained battery may result in defibrillator/monitor power loss. Use only the Battery Support System to maintain batteries.

Auxiliary Power Module Warning

- **Possible device shutdown during patient care**. The AC and DC auxiliary power modules trickle-charge batteries installed in the defibrillator/monitor; they do not maintain batteries. Batteries can be maintained only by using the Battery Support System.

Testing Warnings

- **Shock hazard**. During defibrillation cable testing, the discharged energy passes through the cable snap connectors. Be sure that the cable connectors are securely attached to the testing device posts.
- **Possible loss of power during patient care**. Battery pins (connectors) in the LIFEPAK 10 defibrillator/monitor and the Battery Support System may be damaged if batteries are dropped or forced into battery wells. Inspect pins routinely for signs of damage.
- **Possible failure to deliver energy**. A defibrillation cable damaged by improper removal from a tester may cause a failure to deliver energy or loss of ECG signal during the next patient use. To avoid damaging the defibillation cable, do not disconnect cable snap connectors from tester posts by pulling on the defibrillation cable or twisting or bending the connectors off the tester posts. Disconnect the cable properly by pulling each cable connector straight out from the post as illustrated in Figure A on page 36.
- **Possible paddle damage and patient burns**. Press paddles firmly onto the Battery Support System test plates when discharging to prevent formation of pits on paddle surfaces. Pitted or damaged paddle plates can cause patient skin burns during defibrillation.

BATTERY MAINTENANCE FORMS

RECONDITIONING PROCEDURE

For use with the Physio-Control® Battery Support System, FASTPAK® and Battery Pak batteries.
- Greater than 80% battery capacity is acceptable
- Alternate every 90 days with Shelf Life Test
- Use Battery Support System at 68-78° F
- For Technical Support, call (800)442-1142 USA

Test Date _____ Battery ID _____

Performed by _____

CHECKLIST (√ circle when done)

O 1 Charge battery until READY light appears
O 2 Cycle #1: DISCHG–CHARGE–READY; disregard reading
O 3 Cycle #2: DISCHG–CHARGE–READY; disregard reading
O 4 Remove battery for 1- 4 hrs. Begin _____ End _____
O 5 Cycle #3: DISCHG–CHARGE–READY; bat. cap. = _____%
O 6 Log Cycle #3 bat. cap.% on back of battery

Cycle #3 bat. cap. greater than 80%?
O Yes–acceptable
O No–unacceptable/discard battery

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SHELF LIFE TEST

For use with the Physio-Control® Battery Support System, FASTPAK® and Battery Pak batteries.
- Shelf Life Test Value of 20 or less is acceptable
- Alternate every 90 days with Reconditioning Procedure (Note: Steps 1-5 equals Reconditioning Procedure)
- Use Battery Support System at 68-78° F
- For Technical Support, call (800)442-1142 USA

Test Date _____ Battery ID _____

Performed by _____

CHECKLIST (√ circle when done)

O 1 Charge battery until READY light appears
O 2 Cycle #1: DISCHG–CHARGE–READY; disregard reading
O 3 Cycle #2: DISCHG–CHARGE–READY; disregard reading
O 4 Remove battery for 1- 4 hrs. Begin _____ End _____
O 5 **Cycle #3**: DISCHG–CHARGE–READY; bat. cap.= _____%
O 6 Log Cycle #3 bat. cap% on back of battery
O 7 Remove battery for 7-8 days and store on shelf
Begin ___/___/___ End ___/___/___
O 8 **Cycle #4**: DISCHG–CHARGE–READY; bat. cap.= _____%

Record: **Cycle #3** bat. cap. _____ %
Subtract: **Cycle #4** bat. cap. –_____ %
Result: Shelf Life Test Value =_____ %

Shelf Life Test Value 20 or less?
O Yes–acceptable O No–unacceptable/discard battery

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BATTERY MAINTENANCE LOG

For use with the Battery Support System for Physio-Control

DATE	I.D. NUMBER	BATTERY TEST PERFORMED	BATTERY TEST RESULTS	BATTERY ACCEPTABLE?	
		☐ Faulty ☐ Reconditioning Procedure ☐ Shelf Life Test ☐ Visual Inspection (case not cracked or broken)	Battery Capacity _____ % Shelf Life Test Value _____ Case OK ☐ Case **not** OK ☐	☐ YES	☐ NO Discard Battery
		☐ Faulty ☐ Reconditioning Procedure ☐ Shelf Life Test ☐ Visual Inspection (case not cracked or broken)	Battery Capacity _____ % Shelf Life Test Value _____ Case OK ☐ Case **not** OK ☐	☐ YES	☐ NO Discard Battery
		☐ Faulty ☐ Reconditioning Procedure ☐ Shelf Life Test ☐ Visual Inspection (case not cracked or broken)	Battery Capacity _____ % Shelf Life Test Value _____ Case OK ☐ Case **not** OK ☐	☐ YES	☐ NO Discard Battery
		☐ Faulty ☐ Reconditioning Procedure ☐ Shelf Life Test ☐ Visual Inspection (case not cracked or broken)	Battery Capacity _____ % Shelf Life Test Value _____ Case OK ☐ Case **not** OK ☐	☐ YES	☐ NO Discard Battery
		☐ Faulty ☐ Reconditioning Procedure ☐ Shelf Life Test ☐ Visual Inspection (case not cracked or broken)	Battery Capacity _____ % Shelf Life Test Value _____ Case OK ☐ Case **not** OK ☐	☐ YES	☐ NO Discard Battery
		☐ Faulty ☐ Reconditioning Procedure ☐ Shelf Life Test ☐ Visual Inspection (case not cracked or broken)	Battery Capacity _____ % Shelf Life Test Value _____ Case OK ☐ Case **not** OK ☐	☐ YES	☐ NO Discard Battery
		☐ Faulty ☐ Reconditioning Procedure ☐ Shelf Life Test ☐ Visual Inspection (case not cracked or broken)	Battery Capacity _____ % Shelf Life Test Value _____ Case OK ☐ Case **not** OK ☐	☐ YES	☐ NO Discard Battery

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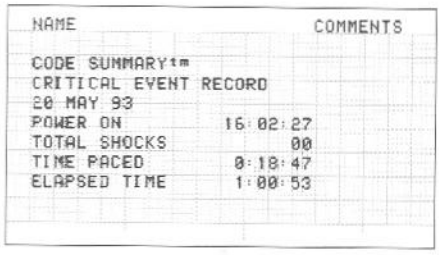
CODE SUMMARY STRIP FORMATS

Formats for each code event print on paper designed for thermal array recorders and fit on standard 8-1/2 by 11 inch paper.

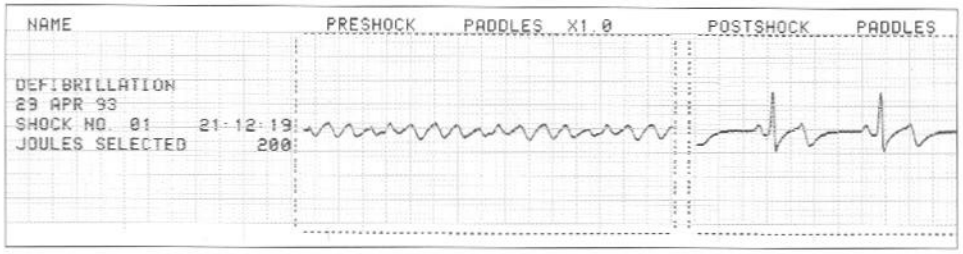
Initial Format



The first section of the CODE SUMMARY printout is an overview of the use of the defibrillator/monitor, including:

- Space for patient's name
- CODE SUMMARY critical event record label
- Date
- Power on time
- Shock tally
- Total time pacing energy delivered
- Time from power on to CODE SUMMARY printout

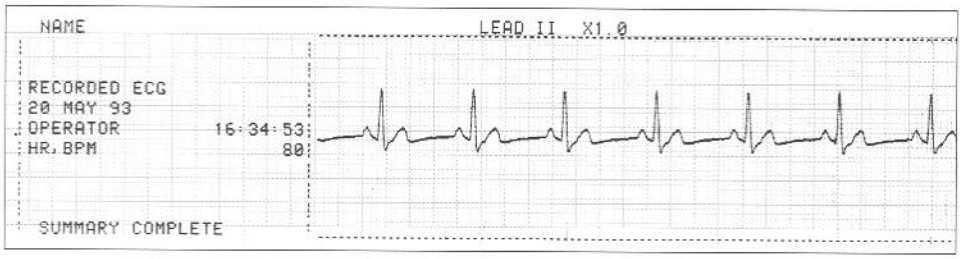
Defibrillation Format



The defibrillation format is printed for each shock delivered (CODE SUMMARY feature requires at least 7 seconds between shocks to enable each shock to be stored in memory). The defibrillation format includes:

- Space for patient's name
- DEFIBRILLATION label
- Date
- Shock number and time delivered, energy selected, SYNC mode (if engaged)
- 3 seconds of ECG immediately preceding defibrillation
- 5.5 seconds of ECG immediately following defibrillation (beginning 3 seconds after discharge to allow defibrillation offset to clear)
- Annotation of lead and gain settings

Recorder Format



The recorder format summarizes recorder usage during the code. It includes:

- Space for patient's name
- RECORDED ECG label
- Date
- How the recorder was activated (OPERATOR) and time activated
- 6 seconds of ECG: 3 seconds preceding and 3 seconds following recorder activation
- Annotation of lead and gain settings

Noninvasive pacing format

If pacing is activated and pacing controls are unchanged for 10 seconds, the following information is provided:

- Space for patient's name
- PACED ECG label
- Date
- Time pacemaker activated or parameters adjusted
- Pacemaker rate (bpm) and current (mA) parameters
- 6 second ECG strip whenever START/STOP is activated and/or pacemaker control settings are changed and remain changed for greater than 10 seconds
- Marking of each pacing energy stimulus
- Annotation of lead and gain settings

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